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ABSTRACT

Intended for use by rehabilitation counselors and work supervisors, the sourcebook contains 173 problems and solutions provided by rehabilitation engineering. A section titled "Guidelines for Formulating Problem Statements" is intended to summarize the most effective ways for either disabled individuals or rehabilitation practitioners to ask concisely and in functional terms for what is needed from the rehabilitation engineer. The main body of the book consists of brief summaries of actual problems and their solutions in the following areas: activities of daily living, communication, homemaking, mobility recreation training, transportation, and work. The last section presents an annotated listing of the contributing rehabilitation engineering centers and projects as well as other resources. The annotations briefly describe areas of specialization and/or other pertinent information about the resources cited. Indexes provide access by either the problem (etiology/functional limitation) or the solution (device/specific activity). A supplement of over 100 additional case examples is also included. (DB)

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ED201166

Rehabilitation Engineering Sourcebook

U S DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION

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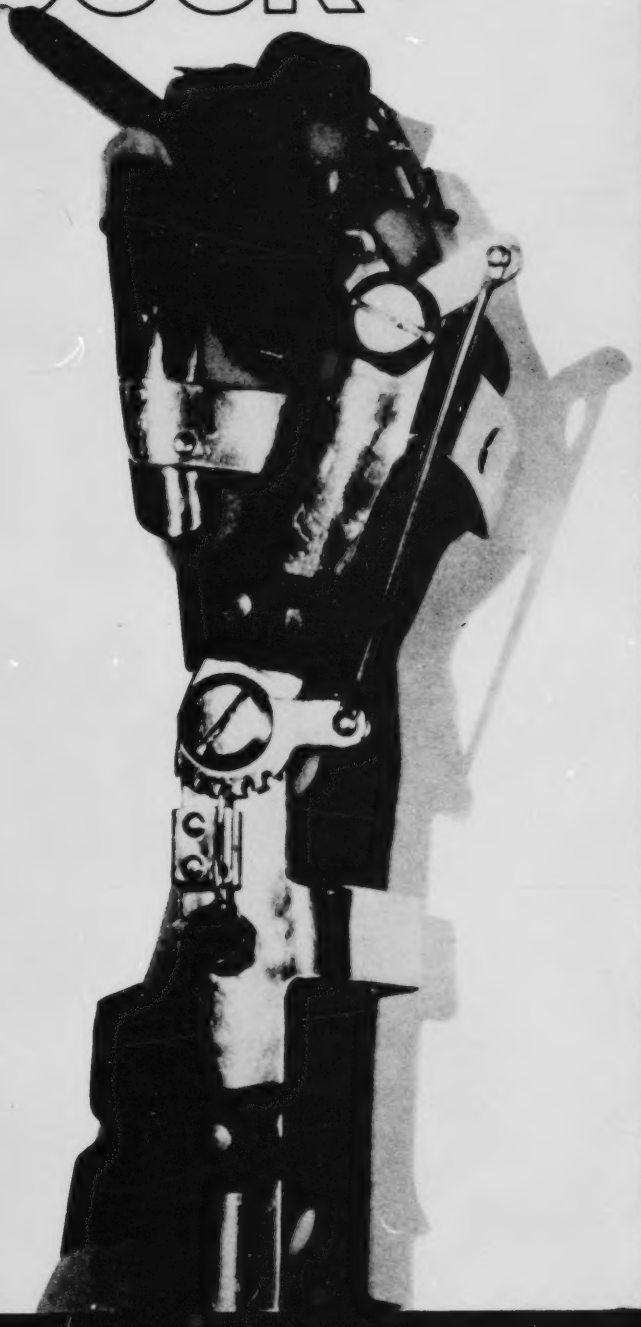

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PREFACE

The topic for this document was selected by a nominating panel of rehabilitation service providers including:

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The Panel suggested several topics of urgent concern, but gave "potential and actual contributions from the field of rehabilitation engineering" their clear top priority rating. The Final Selection Review Board endorsed this choice without reservation, and stressed that the document should be a practical aid to providers rather than an expository work. **Dick LeClair,** Chief, Office of Research Utilization and Training, National Institute of Handicapped Research, deserves the credit for the initial suggestion that the main body of the text consist of case examples — paired statements describing actual problems encountered by people with disabilities and the specific technological solutions which were brought to bear.

This suggestion was followed up by a telephone survey of nearly three dozen rehabilitation practitioners — with state vocational rehabilitation agency counselors and "sheltered" workshop personnel being most heavily represented — seeking opinions on the desirability of such an approach. The idea was met with resounding enthusiasm. Next it quickly became evident that many excellent sources of suitable data existed in the various rehabilitation engineering projects throughout the country.

Participating Projects

A program ideally suited to generating the type of information sought was discovered in Project IMPART (Innovative Matching of Problems to Available Rehabilitation Technology), established by the Texas Rehabilitation Commission in collaboration with the Southwest Research Institute with funding assistance from the Rehabilitation Services Administration. IMPART acts as a clearinghouse in that it receives rehabilitation problems and searches for individualized solutions. It is a public service available to anyone living in Texas and neighboring states who has a work related rehabilitation problem. **Dr. Carol Whitcraft**, Project Director, expressed the opinion that information sharing such as planned for this document was "an idea whose time has come" and became the first rehabilitation engineering project director to participate in its development.

The problem/solution format was quickly dubbed a "Dear Abby" approach, which brought to mind another source of information, one long appreciated by counselors in the California Department of Rehabilitation. For more than five years, A.G. Garris, Assistive Device Consultant with the California agency, has written a column in the departmental newsletter titled "Dear A.G." Questions are submitted by counselors with problems relating to some aspect of their clients' performance capabilities in the hope that A.G. might know of some technological solution. The column has been greatly appreciated over the years because he often did know of a workable solution. When he did not, he was available to evaluate the situation and could frequently devise one. A.G. too, was pleased by the opportunity to see wider dissemination of the fruits of his labors, and those of Charles Eckles, a consultant with whom he often collaborates.

A total of 15 different agencies (centers, projects) or individuals contributed to the production of this document. In addition to the IMPART and "Dear A.G." files, other sources of problem/solution statements are described below.

Since 1976, the Rehabilitation Engineering Center of The Cerebral Palsy Research Foundation in Wichita, Kansas, has published a series of technical briefs titled "Problem Solving with Rehabilitation Engineering — Tech Brief". Each brief describes specific problems experienced by clients and employees of Center Industries. Center Industries operates under the

same administration as the Foundation, and is a job shop which predominantly hires workers with disabilities. Innovative jigs and fixtures created for use there are well represented in the briefs. **John Jonas,** Executive Vice President of the Foundation, provided the needed materials for abstracts of selected briefs to be included here.

Jerry Kuns, Vocational Specialist for the Sensory Aids Foundation of Palo Alto, California, provided materials describing work and training related problems experienced by blind or partially sighted individuals and the technological solutions which were successfully applied by Foundation staff, often in collaboration with other agencies. The California Department of Rehabilitation, and the Rehabilitation Engineering Center of the Smith-Kettlewell Institute of Visual Sciences in San Francisco directed by Lawrence Scadden, are two primary examples of collaborators.

Dr. Samuel Genensky, Director of the Center for the Partially Sighted at the Santa Monica Hospital Medical Center, provided additional problem/solution statements relating to sensory aids useful in work, training, or other aspects of the person's life. The Center offers both direct services to individuals and conducts an extensive research program.

Dr. O.B. Billings of The Institute for Rehabilitation and Research at the Texas Medical Center in Houston, provided a large volume of problem/solution statements from their files. All aspects of life performance, from the most basic activities of daily living to very specialized work related demands are well represented in the materials from TIRR.

Mickey Christiason, Recreation Therapist at Rancho Los Amigos Hospital in Downey, California, contributed many items on recreation related devices. Most of these are commercially available but not well known.

The Rehabilitation Engineering Program at Northwestern University contributed a number of items, and **Margaret Pfrommer** of their staff was particularly helpful in providing follow-up information.

Anthony Staros, Director of the Veterans Administration Prosthetics Center, arranged for the contribution of several richly detailed descriptions of extensive technological intervention on behalf of very severely disabled individuals. Many of these solutions reflect the innovative work of Saleem Sheredos, an engineer who works closely with the VAPC Clinical Engineering Center.

The Rehabilitation Engineering Department of the Woodrow Wilson Rehabilitation Center in Fishersville, Virginia, contributed items reflecting the innovative work taking place in that program. **Reuven Kruger,** of the Research Utilization Laboratory made the materials available.

Florian Caligiuri, Executive Director of the California Association of the Deaf provided materials for the development of items illustrating problems and technological solutions for people who are deaf.

Ray Disinger, Director of the Special Assistance to the Handicapped Office of Pacific Telephone in Los Angeles contributed a number of items based on the efforts of that office.

Finally, **James Reswick,** Director of the Rancho Los Amigos Rehabilitation Engineering Center, not only arranged for the contribution of case examples illustrating the work of their Project Threshold, but also provided general consultation and guidance for the development of this document.

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ABBREVIATIONS AND ACRONYMS

ADL	Activities of Daily Living
ALS	Amyotrophic Lateral Sclerosis
BP	Blood Pressure
CCTV	Closed Circuit Television
E&J	Everest and Jennings
HITE	Houston Independence Through Engineering
L.E.	Lower Extremity(ies)
MD	Muscular Dystrophy
REC	Rehabilitation Engineering Center
SCI	Spinal Cord Injury(ed)
TDD	Telecommunications Device for the Deaf
TTY	Teletypewriter
U.E.	Upper Extremity(ies)
VAPC	Veterans Administration Prosthetic Center
VR	Vocational Rehabilitation

INTRODUCTION

Scope of Document

The document is designed to serve as a sourcebook, or reference work, for day-to-day use by rehabilitation practitioners whose clients find themselves barred from certain activities by functional limitations resulting from disablement. Here, the user may learn whether a similar problem has elsewhere been found to have a technological solution. It is a practical aid which chronicles actual rehabilitation problems which have been successfully resolved through the use of technology, especially applications issuing from the field of rehabilitation engineering. Specifically excluded are discussions of historical, theoretical, and programmatic matters (which are covered in considerable detail in other current reports and articles) on the role of rehabilitation engineering in serving people with physical and sensory disabilites.

It is not meant to be a comprehensive or exhaustive sourcebook. It is, rather, a sharing of information which has been recorded in various projects throughout the country on efforts to solve client problems, through means of rehabilitation engineering, which have worked — at least once. The selection of cases presented here reflects the response to efforts to encourage projects and individuals to share information on their successes. It is not intended to reflect the proportionate efforts being directed into the various problem areas nationwide. Also, there has been no intention to generate new information in the course of preparing this document. It is simply a means for disseminating existing information with great utilization potential which has been heretofore available to only a few.

The looseleaf format was selected in response to high priority recommendations given by participants in a study conducted by SRI International, funded jointly by NASA and the California Department of Rehabilitation, aimed at designing a model rehabilitation engineering information exchange system.* Following those recommendations, the materials presented here are construed as a "starter set" to which the user may add as further resource information of a similar sort becomes available.

The following section, titled "Guidelines for Formulating Problem Statements" summarizes the most effective ways for either disabled individuals or rehabilitation practitioners to "place their orders". That is, it describes how to ask concisely and unambiguously for exactly what is needed — in functional terms — so the respondent can search effectively and efficiently for exactly what is needed — in technological terms — to devise a solution.

Section Three, titled "Case Examples: Problems and Solutions" comprises the main body of the text. These are brief summaries of actual problems experienced in the life performance areas of: Activities of Daily Living, Communication, Homemaking, Mobility, Recreation, Training, Transportation, and Work, paired with solutions which were successfully used by or known to the contributors. It is hoped that this material will serve as a consciousness-raising function, with respect to the remarkable technological potential existent today, as well as its more specific informational function relating to the cases cited. The fact is, there are now technologically feasible solutions to a heretofore undreamed of range of problems stemming from physical and sensory disabilities. Now that this potential is being recognized with increasing funding from a variety of sources, progress is being made at a quickening pace. Today, there is often good reason to hope for a device or a system that will make it possible for a blind, deaf or paralyzed person to do with relative ease what was unequivocally impossible less than a decade ago. The materials in the third section will demonstrate this, and will also give the reader an overview of types of work being pursued by each of the contributing projects.

Section Four presents an annotated listing of the contributing rehabilitation engineering centers and projects. The annotations briefly describe areas of specialization and/or other pertinent information about the resource cited. The citations in this section are also given as sources of further information relating to specific case examples in Section Three. They are repeated in Section Four simply as a convenience to the reader.

Intended Audience

Because the focus of this document is on the types of problems encountered by disabled people after they have reached the vocational stage of their rehabilitation, it is oriented toward a primary audience of rehabilitation counselors and work supervisors. Whether a rehabilitation counselor is employed by a state vocational rehabilitation agency, a local government, a private agency or facility, or is working in private practice, the problem/solution case materials presented here should have relevance to problems encountered in the caseloads. Just as no two human

*Christy, et al, "Suggested Approach for Establishing a Rehabilitation Engineering Information Service for the State of California," Stanford Research Institute International, 1978.

beings are alike, no two problems and their solutions will be identical; but similar problems which have been successfully resolved should provide direction to the counselor in seeking a workable variant that will solve the problem at hand. The same holds true for work supervisors, whether they are employed by "sheltered" workshop facilities or are working in mainstream industry.

It is expected that other rehabilitation practitioners will also find the document useful. Rehabilitation staff in hospitals may find that the kinds of rehabilitation planning they do at the early stages of rehabilitative treatment are influenced by their knowledge of the increased potential of their patients for future life and work activities. Thus, occupational, physical, and recreational therapists, nurses, physicians, and other allied health professionals may make use of this sourcebook. It may also contribute to meeting the needs of rehabilitation engineers — as suggested in the SRI International report cited earlier — for "information on past attempts to design equipment for particular needs."

Usage of Document

This sourcebook can be used in several different ways. One reader may wish to simply read through it to gain an overview of the kinds of technological solutions which have been devised to meet problems which rehabilitation counselors, work supervisors, and others confront in their work with individuals who have disabilities barring them from certain activities. Such a reader would be making use of the consciousness-raising function of the document, becoming familiar with the general range of problems which can be solved through the application of technology.

Another reader may already be aware of the general range of solutions being made possible by the field of rehabilitation engineering, and want to use the sourcebook strictly as a reference manual, to look up specific solutions which have been devised to meet a particular type of client problem. This reader might use the index tabs to locate the life performance area in which a client is experiencing difficulty, or the "problem index" listings at the end of the document to locate a specific problem, or type of problem, which parallels that being confronted.

Still other readers may have heard of devices, or seen them, but be unsure of their applications. They could use the "solution index" listings at the end to locate the device in question in order to learn how that device has been used for practical problem solving.

Every effort has been made to provide ample descriptors in the indexes to help readers who may have only fragmented information about devices, or who may view the problem in terms of global disability categories as opposed to specific functional limitations. Descriptors relating to job or other life performance area demands are also included, providing an additional way to key into the materials presented.

When the solution consists of a commercially available device, the name and address of at least one vendor is mentioned, and telephone number, contact name, and approximate cost range are given if available. When applicable, additional sources of further information are also given.

When an innovative solution is described, the name of the innovator (usually by organization rather than an individual) is provided along with the appropriate address to which to write for further information. Many of the simpler innovative solutions could potentially be replicated, or serve as a starting point for innovative variation, using only the information presented here — particularly when illustrations have been provided.

Some of the more complex innovative solutions cannot be described in adequate detail to permit replication in a sourcebook such as this. The contributors to this sourcebook will welcome inquiries from users who wish to make use of solutions they have devised, and the needed information for such follow-up is given with each case example.

The format of the sourcebook allows the user to enter notes when further information is obtained relative to specific problem/solution pairs and to include additional problem/solution pairs which may become available from a variety of sources, including personal experience.

Future Development of the Sourcebook

As indicated earlier, the present document is construed as a starter set to which users may add new materials of a similar sort as they become available. Should it be warranted by the response to this initial attempt to organize scattered pockets of information into a useful overview of rehabilitation engineering accomplishments, the Institute for Information Studies may continue to produce supplementary materials for inclusion in Sections Three (case examples) and Four (annotated listing of resources). Hopefully, other organizations will be encouraged to do so as well. For this reason, the Institute will appreciate feedback as to the utility of this document and suggestions for how future efforts along similar lines might be improved. The form included with this package of materials is an evaluation form, and it is hoped that you will complete and return it for this purpose.

GUIDELINES FOR FORMULATING PROBLEM STATEMENTS

"The quality of the answer depends on the quality of the question."

In order to make the most effective use of consultants, specialists, and other experts, there is a fine art which must be developed — the art of asking the question. Conversely, one of the greatest deterrents to getting an answer that will help is failing to phrase the question in a precise, unambiguous manner.

This is a familiar issue to rehabilitation counselors who work in state vocational rehabilitation agencies and contract for work evaluation/adjustment services from workshops and other rehabilitation facilities. If they don't spell out exactly what they want to know about a client's work capabilities and limitations, they may receive an interesting report which, nonetheless, offers little helpful guidance for rehabilitation planning. The facility staff are acutely aware of the problem, too. They express frustration over having to "second guess" what the referring party wants to know when the request is a global plea for help rather than an explicit, itemized requisition for discrete items of information.

This is a very old problem within the public-private rehabilitation partnership, and the lessons are being learned continuously by newcomers to the field. The same kind of problem is now arising in the new interdisciplinary partnership between rehabilitation practitioners of various sorts and rehabilitation engineers. For example, many of the questions and problems posed to Project IMPART of the Texas Rehabilitation Commission and the California Department of Rehabilitation's Rehabilitation Engineering Section are questions that might more properly be addressed to another kind of consultant, or they provide insufficient background information to allow the technological specialist to comprehend the actual and specific need.

Now that referring parties are beginning to learn how to "place their orders" correctly with work evaluation/adjustment facilities, they must learn to place a different kind of order with technological specialists. It is even more crucial to do so for this reason: referring parties ordinarily use work evaluation/adjustment facilities in their own local areas. Thus, any needed follow-up to clarify an unclear request — though time consuming — is fairly easy to accomplish logistically. This is not so with many of the rehabilitation engineering resources. Project IMPART, for example, is a public service available to anyone in Texas and neighboring states who has a work-related rehabilitation problem. Frequent long distance calls to Austin, Texas may be frowned upon. And well they might, when the need could be circumvented by learning how to phrase the request precisely and unambiguously in the first place.

Many readers of this document will have clients on their caseloads or disabled workers under their supervision who might be helped to function more independently or efficiently through the application of technology. The reader, therefore, may wish to submit a problem to one of the resources learned about here — or perhaps some other — in hopes of finding a feasible, affordable, technological solution to a rehabilitation problem. The following guidelines are offered to help in formulating the statement of the problem in a way that will facilitate an on-target response with minimal delay.

First, it is important to adopt an analytic mode of thinking, a mental set of breaking down the global, problem-fraught situation into its component problem parts. The technological consultant needs to know what, specifically, the person needs or wants to do that she/he cannot because of what specific functional limitation(s).

The problem statement should describe the specific activity the person needs/wants to perform in what may seem to be microscopic detail. To say that the person wants to work as a secretary is not explicit enough. What particular **aspects** of secretarial work are impeded by the person's functional limitations? Is it reaching top filing drawers from a wheelchair? Is it typing at a competitive rate due to shoulder weakness? Each specific aspect of impeded performance must be spelled out.

It is important in this respect to remember that the rehabilitation engineer or other technological consultant is an expert in **technology**, but not necessarily in jobs, homemaking, recreation, or whatever the life performance area in question may be.

As implied above, the specific nature of the functional limitation(s) must also be spelled out in detail. Diagnostic categories such as spinal cord injury, poliomyelitis, arthritis, and the like do

not tell enough. Even as explicit a descriptor as "quadriplegic" does not convey suffient information because the term is applied to a considerable variety of functional patterns. The specific activities which are impeded must be spelled out; such as manipulating tape recorder controls, lifting a telephone receiver, or reaching materials.

One of the most basic rules of good report writing also applies to the formulation of problem statements in a request for rehabilitation engineering consultation. That is, "Avoid abstractions and write in terms of directly observable behavior." In report writing, this rule avoids the miscommunications that can arise when the writer and a reader **interpret** abstract conceptions such as "the client tends to be 'dependent' or 'well motivated' " in different ways. However, if writers describe the **behavior** which leads them to conclude that a client is 'dependent' or 'well motivated', then readers can draw their own conclusions from the behavioral data and misunderstandings are less likely to occur.

In consultation requests, the rule provides the same sort of protection against ambiguity. For example, to say "The client can type only fifteen words per minute due to upper extremity weakness" does not convey the picture one would observe if one had the opportunity to watch the client type. On the other hand, to say "The client has good use of her hands but only fair biceps and extremely weak shoulders; thus, she has the dexterity to type but cannot hold her arms in position for more than half a minute without resting for an equal time" gives the consultant an immediate picture of the **type** of solution needed. All that is left is to determine how to implement it.

In summary, the essential information needed is a description of the client in terms of the particular functional limitations which are interfering with his or her efforts to perform a specified activity or set of activities. In addition, it is generally helpful to provide the person's disability diagnosis and any background information which might clarify the problem statement. An important example would be previous efforts to achieve a technological solution which were less than satisfactory.

In formulating the statement of the problem, it may help to ask yourself if you have dealt adequately with each of the following questions:

1. What does the individual want or need to do that s/he cannot do:
   a. At all
   b. Efficiently/effectively?
2. What is the general nature of the desired/needed activity in terms of basic life performance areas? (E.g., training, work, homemaking, recreation, ADL, communication, mobility, transportation, two or more of these designations, other.)
3. What specific activity (or activities) does the individual wish/need to engage in?
   (E.g., secretarial work, college coursework, cooking, bowling, grooming, speaking, stair climbing, driving, other.)
4. What specific aspects or components of this activity are impeded?
   (E.g., reaching, lifting, manipulating small objects, reading, telephoning.)
5. What is the general nature of the functionally limiting condition that interferes with performing the activity (or activities)?
   (E.g., Post-SCI quadriplegia, post-polio weakness, arthritic joint inflammation, visual impairment, hearing impairment.)
6. What is (are) the specific functional limitation(s) associated with the conditions that preclude or impede performance?
   (E.g., lack of finger function, unable to do independent wheelchair transfer, unable to grasp objects, 20/400 vision in better eye, total deafness.)
7. How do the specific performance demands of the activity interact with the individual's specific functional limitations to create the performance problem?
   (E.g., unable to dial telephone, unable to transfer to toilet during work hours, unable to squeeze stapler, unable to read small typeface on insurance documents, unable to hear warning signals.)
8. What kind of help is wanted/expected from the technological consultant queried?
   (E.g., evaluation only, referral to existing/local resources, device development, other.)

As can be seen, this is a funneling technique in which the questions evolve from the general to the progressively more specific in terms of both the performance demands of the activity in question and the functional limitations that interfere with its execution. By answering these questions, you can better ensure that your problem statement will communicate the needed data precisely and unambiguously to the technological consultant whose help you are seeking.

CASE EXAMPLES: PROBLEMS AND SOLUTIONS

This section is comprised of case examples in the form of problem/solution pairs. It has been divided into eight subsections each of which contains problem/solution pairs applicable to a particular life performance activity. The eight subsections include Activities of Daily Living, Communications, Homemaking, Mobility, Recreation, Training, Transportation, and Work.

The format of problem/solution pairs has been standardized to facilitate easy reading and quick-look referral. Problem/solution pairs contain the following components:

Case Number	**Problem Description: (title)**
Impairment Etiology(ies)	_____
Functional Limitation(s)	_____
Performance Activity	_____
Device Name	**Solution Description: (title)**
	_____
	_____

Each component of the problem/solution format is described below.

Case Number

Each case number uniquely identifies a particular problem/solution pair. The case number consists of an alphabetic designator followed by a dash and a unique, two-digit number which is assigned sequentially. There are eight alphabetic designators; they represent the life performance activities into which problem/solution pairs may be categorized. The eight designators include:

A — Activities of Daily Living
C — Communications
H — Homemaking
M — Mobility
R — Recreation
T — Training
P — Transportation
W — Work

Thus the first two problem/solution pairs under the category Activities of Daily Living are assigned case numbers A-01 and A-02; the first two entries under the category Communications are C-01 and C-02, and so on.

Impairment Etiology

This element provides information about the disabling condition(s) which may result in functional limitation(s) that interfere with the performance of a particular activity. Examples of entries under this component include Spinal Cord Injury (SCI), Cerebral Palsy, and Stroke. Some solutions have been found applicable to specific functional limitations regardless of impairment etiology; the designation "any etiology" has been used to indicate this situation.

Functional Limitation(s)

Functional limitation(s) describes the particular physical or sensory deficit(s) associated with the impairment etiology which precludes or impedes performance of some activity. Examples of specific functional limitations include respiratory paralysis, limited grasp, or upper extremity weakness.

Performance Activity

The performance limitation is described in terms of the specific activity to be performed as opposed to the more general categories such as homemaking or work. Specific performance activities include breathing while sitting, stair climbing, reading, or wheelchair propulsion.

Device Name

The term shown indicates the general type of device utilized to solve a particular performance problem. Types of devices may include dexterity aids, mobility aids, remote controls or muscle stimulators.

Problem Descriptions

Problem descriptions provide information about the circumstances surrounding a specific requirement for a technological solution. Information provided includes client characteristics and needs, environmental factors, activities to be performed and any other attendant circumstances. A brief descriptive title is provided to facilitate scanning.

Solution Descriptions

Solutions are described in terms of the specific device and/or methods utilized to solve a particular performance problem. Explicit, how-to-do-it descriptions are provided when necessary for clarity and may also include illustrations. Vendor information is also provided. Brief titles are provided to assist the reader while scanning.

For Further Information (FFI) Codes

These codes, which appear at the end of each solution description, refer the reader to the listings in Section IV, Resources for Further Information and Solutions. (Section IV provides more detailed information about vendors, exhibitions, publications and rehabilitation engineering centers.)

The problem/solution pairs which comprise this section may be used in two ways. Readers may scan the key words to the left of each case example to identify the types of problems and available solutions associated with each of the eight major performance categories. The brief titles provide further information about specific problem/solution pairs. Alternately, readers who require a solution(s) to specific performance problems or detailed information about the availability and application of specific devices may use the key word indexes located at the end of this document.

A-01
Paraplegia
Bathing

Mobility Aid

PROBLEM: Unable to enter bathtub.
A client with paralysis of the lower extremities sought information regarding a device to help him get in and out of the bathtub.

SOLUTION: Commercially available bathtub lifts.
IMPART identified the following vendors of suitable devices: 1) Hydraulic chair lift, Invacare Corp., 1200 Taylor St., Elyria, OH 44035, 2) Waterpowered bath lift, Aqualift, Triaxon, Inc., P.O. Box 415, Glenview, IL 60025, (312) 724-0038, 3) Portable water-powered bath lift, National Products Co., P.O. Box 483, Waukesha, WI 53186, 4) Nolan waterpowered bath lift, J.E. Nolan & Co., Inc., P.O. Box 43201, Louisville, KY 40243, and 5) Bath lifts PC 7185F and PC 7188, I.A. Preston Corp., 71 Fifth Ave., New York, NY 10003, (212) 255-8484. Inquire direct for costs. FFI #13

A-02
Polio
Respiratory Paralysis
Breathing While Sitting

Respiratory Aid

PROBLEM: Desire to shed respirator for extended periods.
A post-polio patient felt that with some assist in rhythmic pushing against his diaphragm he would be able to get along without a respirator for extended periods of time.

SOLUTION: Lapboard respiratory assistive device.
A battery operated pusher device was constructed, which while pushing against his belly displaced viscera upward against the diaphragm and caused exhalation. It was quite successful allowing him to shed his respirator for extended periods of wheelchair sitting. FFI #6

A-03
Hand Paralysis
Brushing Teeth

Dexterity Aid

PROBLEM: Inability to squeeze.
A patient, handicapped by lack of hand function and with very little hand strength found it impossible to squeeze the toothpaste from a tube.

SOLUTION: Toothpaste dispenser.
A slotted holder for a tube of toothpaste, fitted with a roller which fits into the slots, and a handle permitting considerable leverage for squeezing the tube was constructed. This patient was then able to handle very easily any tube squeezing task. FFI #6

A-04
SCI
Quadriplegia
Depressing
Muscle Stimulator

PROBLEM: Unable to depress independently to relieve skin pressure.
A high level quadriplegic client needed assistance at regular intervals to shift weight during sitting periods to prevent ulcer formation.

SOLUTION: Muscle stimulator.
A bilateral, master/slave, multi-site triceps muscle stimulator was developed and fabricated. It was necessary to brace the patient's forearms. A development program was required to strengthen unused muscles. FFI #6

A-05
Cerebral Palsy
Door Opening/Closing

PROBLEM: Unable to open/close door.
A cerebral palsy handicapped patient with limited arm extension could not open and close his door from his wheelchair or operate the lock.

Remote Control

SOLUTION: Remote control.
A remote control electrical door latch and lock were designed and installed. Available from HITE, P.O. Box 57843, Webster, TX 77598 for approximately $600. FFI #6

A-06
Stroke
Limited Grasp
Eating

PROBLEM: Reaching and grip weakness.
A man who has had a stroke cannot lift tableware up all the way to his mouth in order to feed himself and has difficulty in gripping small objects.

Dexterity Aid

SOLUTION: Personal eating equipment.
Fred Simmons, Inc., Box 32, Brookfield, IL makes a variety of tableware equipped with enlarged and elongated handles. These extensions can also be made by bolting on a strip of plastic to a fork or spoon. Check out muscle control under supervision at first to insure safe usage. FFI #4

A-07
Quadriplegia

PROBLEM: Unable to operate appliances.
A high level quadriplegic was unable to operate any of the appliances in his home and bedroom.

Environmental Controls

SOLUTION: Environmental control unit.
During his hospital stay he was trained to use a sip and puff mouth switch. On his return home he was provided with an ECU-2 environmental control unit from Prentke Romich Company with sip/puff switch and two remote control receptacles. With this equipment, using only the sip/puff switch, he was able to operate all of the lights, radio, TV, and other appliances in his immediate environment. Available from Prentke Romich Co., RD2, Box 191, Shreve, OH 44676, (216) 567-2906, for approximately $600. FFI #6

A-08
Quadriplegia
Paralysis

PROBLEM: Severely limited reach
High level quadriplegics using environmental control systems frequently need to bring the controls into manipulative range and also to get them out of the way of some activity.

Environmental Controls
Operation
Mobility Aid

SOLUTION: Autopositioner
An "Autopostioner" was designed and built. The autopositioner is a compact, portable system which allows a patient, who can whistle or hum, to control certain electronic systems situated within his environment. The device is mounted to the frame of a bed, or it may be positioned on a table edge for wheelchair usage. The patient whistles or hums to summon or retract the environmental control index device. Additionally, this device can be activated by a head switch or any other switch usable by the patient. FFI #6

A-09
Quadriplegia
Lifting Light Objects

PROBLEM: Inability to manipulate light objects
Many quadriplegics are unable to lift/manipulate even very light objects, such as paper money, coins, typing paper, book pages, and playing cards when daily living, work, or recreational pursuits require it.

Dexterity Aid

SOLUTION: WWRC mouthstick
The Woodrow Wilson Rehabilitation Center's Rehabilitation Engineering Department developed a mouthstick comprised of a 17 inch hollow aluminum arrowshaft mounted in a mouthpiece of dental acrylic and with a small rubber suction cup attached to the distal end.

Sucking action will adhere any light, smooth object. Tongue placement over the mouthpiece opening eliminates need for further sucking action. Weight, 8 ounces. Fabrication costs, approximately $8.00. Not yet available commercially. FFI #11

A-10
Quadriplegia
Operating Tape Recorder

Dexterity Aid

PROBLEM: Unable to operate tape recorder.
A high quadriplegic could not operate the controls of a Craig tape recorder microphone/hand control.

SOLUTION: Lever extensions
The control switches were modified by lever extensions so that they can now be operated with a mouthstick. FFI #6

A-11
Complete Quadriplegia
Page Turning
Mobility Aid

PROBLEM: A quadriplegic with no arm movement wants to turn pages of books and magazines in order to read independently.

SOLUTION: Page turning devices.
There are a number of page turners on the market. In order to operate them, microswitches must be placed within reach of well-controlled body movements, such as head or chin movements. These machines are extremely expensive, most costing over $1000, and can malfunction causing the reader much frustration. Ask for a trial use prior to purchase. Forward and backward page mobility is useful for some persons who like to read magazine articles of their choice and priority. Touch-Turner Co., 1808 10th Avenue, East Seattle, WA 98102, sells a page turner. FFI #4

A-12
Cerebral Palsy
U.E. Impairment
Playing Radio-Tape Recorder

Dexterity Aid

PROBLEM: Inability to operate radio-tape recorder
A cerebral palsied child had a combination tape recorder, calendar, AM-FM combo but she was unable to master the controlled hand and finger movements needed to operate the control keys. She was adept with a head pointer but could not depress the control keys with it.

SOLUTION: Modified radio-tape recorder for use with head pointer
A cross bar was fastened to the appliance and a number of long keys, each with a large concave button, were hinged in place so that each could depress an operating key. The child was able to depress the key buttons with a head pointer. FFI #6

A-13
Blindness - Legal
Reading

Sensory Aid

PROBLEM: Reading menus and checks in dimly-lit restaurant
Worker with partial vision (no vision in left eye, 20/800 in right eye, and almost normal visual field in right eye). This worker has a need to go to restaurants with guests as part of his business day. Often these restaurants are very dark and he has great difficulty reading a menu or the check in the available light.

SOLUTION: Penlight
To solve this problem he uses a penlight that involves a flashlight bulb and two AA batteries. Penlights of this sort are frequently available at hardware stores and drug stores. They sell for about $2 or $3. Be sure to obtain a penlight that uses AA batteries rather than AAA batteries, because AAA batteries wear out much more rapidly than AA batteries and, in the long run, will add significantly to the "operating cost" of the flashlight. FFI #5

A-14
Low Vision
Reading

PROBLEM: Difficulty reading small print, scanning lines
A VR client who has had a stroke and has low vision experienced difficulty in reading newsprint. Aids or techniques were also needed that would enable him to follow a line of print across the page and scan to the subsequent line easily.

Sensory Aid

SOLUTION: Low vision table reading aid
An IMPART team member designed and built a device of lightweight durable aluminum to hold reading material in front of a person with very low vision. The material is placed on a 12" by 16" moveable platform tilted to 75°. The 75° tilt places the reading matter at a more comfortable angle and reduces the strain on back and neck muscles caused by reading with material on flat table surface. With lens magnification up to 20X power, the user can move the material in front of the lens for each sentence and then the material can be elevated to the next sentence, returned to the left margin and reading begun again. Thus, the reading material is moved with a minimum of head and eye movement, reducing the error of losing one's place. The framework supporting the moveable platform is also made of aluminum. A large knob is used to elevate the platform. A line indicator can be attached to the platform. FFI #13

A-15
SCI
Quadriplegia
Securing Drugs

PROBLEM: Unable to secure drugs in dormitory setting
In a dormitory setting a quadriplegic was not able to secure against pilfering his supply of drugs and medications.

Dexterity Aid

SOLUTION: Pushbutton combination lock box
A pushbutton combination lock was installed on a drug box. The box was bolted to the furniture. It was so arranged that it could be operated by a quad from a wheelchair by use of a mouthstick. FFI #6

A-16
Finger Weakness
Shaving

PROBLEM: Inability to operate pressurized cans
With severely limited finger strength, a man was not able to operate a pressurized can of instant shaving cream.

Dexterity Aid

SOLUTION: Shaving cream dispenser
The Biomedical Engineering Department designed and built a holder for the can, with a lever arm over the top, permitting the button on the pressurized can to be depressed with almost no strength required. It worked very well. FFI #6

A-17
Hand/Wrist Immobility
Shaving

PROBLEM: Inability to use standard shaver
A man, handicapped by severely limited hand function and wrist motion, was not able to hold an electric razor and manipulate it so as to shave himself satisfactorily.

Dexterity Aid

SOLUTION: Electric razor manipulator
A clamp-on handle was designed and built for an electric razor permitting this patient to neatly shave himself. The superb design of this manipulator allows the user to maintain the shaving head in contact with the face by simple movement of one hand forward or backward with respect to the other. A unique spring loaded tilt mechanism allows manipulation of the razor so that under-the-chin shaving can be accomplished with correct pressure and minimum effort. FFI #6

A-18
SCI Quadriplegia
UE Paralysis
Shaving

Mobility Aid

PROBLEM: Inability to use standard razor
A C-6 quadriplegic with an orthosis found it impossible to reposition a safety razor in his orthosis in order to obtain the correct angle for shaving.

SOLUTION: Safety razor with adjustable handle angle
A Gillette TRAC-II razor was modified by cutting the handle through about one inch from the original angle in the razor handle. A double ball joint was inserted at this point giving capability of full rotation and unlimited handle angles.

The individual was then able to reposition the razor head to give whatever angle was needed by pushing it against the solid support. The locking mechanism was used to give enough rigidity to shave, but still to permit changing the angle by pushing it against something. A half dozen razors have been made and are being used by C-5, C-6, and C-7 quadriplegics. FFI #6

A-19
Post-Polio
Paralysis
Sitting

PROBLEM: Pressure sores
One of the factors controlling and often limiting the length of time quadriplegics can remain seated in an upright position is the tendency to develop decubitus ulcers. When the ability to voluntarily shift positions periodically is lost, care must be taken to shift the patient at regular intervals by an attendant.

Positioning Aid

SOLUTION: Automated posture control
In order to increase the independence of one post-polio quadriplegic, a powered assist device was developed and fitted to shift his position by pushing on his knees. A compressed CO_2 powered cylinder between the knees periodically pulls on knee pads, raising the patient, and allowing increased circulation in the gluteal area.

The fit of the knee pads is important for comfort. The frequency, length of cycle, and direction are adjustable. It is perfectly feasible to automate the cycle or to connect it to a manually operated switch so that the patient can determine the frequency with which he shifts position.

The patient for whom it was designed experienced much more comfort and was able to sit for much longer periods without adverse affects. FFI #6

A-20
Paraplegia
Toileting

Wheelchair Modification

PROBLEM: Electric wheelchair to toilet transfer
A female paraplegic found it impossible to transfer herself from her electric wheelchair to the bathroom commode.

SOLUTION: Move battery assembly forward
The battery assembly of the wheelchair was relocated under the wheelchair seat so that the wheelchair could be backed up to bring the patient to the commode seat. The back of the wheelchair was modified to snap out. Now the patient can slide herself directly back through the wheelchair onto the commode. FFI #6

A-21
Cerebral Palsy
Back Pain
Traveling

PROBLEM: Need for portable bedboard when traveling
A cerebral palsied client with back pain problems needed a portable bedboard which could be used for sleep support when traveling.

Bedboard

SOLUTION: Commercial portable bedboard
IMPART found a suitable bedboard available from Nelson Medical Products, 5690A Sarah Ave., Sarasota, FL 33581. Suitable devices are also available from catalog sales at both Sears and Montgomery Wards. All retail for approximately $15. FFI #13

A-22
Any Etiology
UE Paralysis
Typing

PROBLEM: Off the shelf head styli inadequate, too expensive
For a person with little or no use of the upper extremities, a head stylus offers a means for typing. Off the shelf styli tend to be expensive, however, and often need modifications which are hard to obtain and entail further expense.

Dexterity Aid

SOLUTION: Stylus for typing
A stylus holder headpiece was made from a commercially available interlining from a safety helmet. The lining can be adjusted to fit most any head size and also includes an adjustable chin strap that helps to stabilize the stylus. The stylus holder consists of a small length of copper tubing which is brazed to a piece of sheet metal approximately 2 inches by 1 inch. The tubing is then bent down at an angle of approximately 45 degrees to position the wand within the field of vision. The piece of sheet metal is riveted to the helmet liner so that the outer shell of the liner is sandwiched between the stylus holder and the back plate. The inner lobe of the liner keeps the back plate away from the person's head. The wand may be made from plastic and cut to the most suitable length. It is very simple to make and can be produced by anyone able to use simple hand tools. FFI #1

A-23
Brain Damage/Stroke
Paralysis/Drop Foot
Walking

PROBLEM: Drop foot
Many head injury and stroke patients require drop foot correction during the swing phase and foot/ankle stabilization through the stance phase in order to approximate a normal gait.

Transcutaneous electrical stimulation of the peroneal nerve is effective in achieving these corrections. A drawback has been neuro-muscular fatigue of such magnitude that the system lost its attractiveness to the patient and was discarded.

The fatigue, due to continuous peripheral nerve stimulation, can be reduced by programming the stimuli to give a pattern of intermittent pulses. One can vary the dropping of pulses during the evaluation phase to see the best pattern.

Mobility Aid

SOLUTION: A programmable extended train peroneal stimulator
Such a system was built and found to be equally effective in controlling gait correction while reducing markedly the fatigue factor.

Another feature is that the pulse amplitude of the stimulus for the different phases of the cycle is independently controllable and can be more easily matched to the requirement of the patient. It was found that more stimulus was needed in stance than swing because limb is loaded in stance.

The result is far greater acceptance of the system by patients in correcting their gait problems following head injury and stroke.
FFI #6

A-24
Polio
Quadriplegia
Weighing

PROBLEM: Obese wheelchair user must weigh daily at home
The freedom of being able to weigh has been denied to those individuals who cannot stand on a scale. Rehabilitation Centers usually have floor level scales but other places do not.

Mobility Aid

SOLUTION: Bathroom scale attachment
Two channels wide enough to fit wheelchair tracking pattern were positioned over a bathroom scale. The channels were only ½" from the floor. The user rolls the wheelchair on the channels, checks the dial, subtracts the weight of the wheelchair. A similar unit is available from Nelson Medical Products Company, 5690 A Sarah Ave., Sarasota, FL 33581 for approximately $50.00. FFI #4

A-25
Quadriplegia
Wheelchair Propulsion

PROBLEM: Unable to propel manual wheelchair
A quadriplegic patient needed a mechanism to utilize his shoulder muscles to propel a wheelchair.

Mobility Aid

SOLUTION: Adaptive propulsion device
An adaptive propulsion device which fits onto a standard wheelchair has been developed. It is a mechanical system that does not require the patient to use active elbow flexion or grip. The only function required is in the triceps and/or shoulder. FFI#6

A-26
Muscular Dystrophy
Paresis, Severe
Writing

PROBLEM: Unable to write
A muscular dystrophy handicapped individual had some hand muscle control in each hand but essentially zero arm and shoulder muscle control on either side. Arm motion was very much needed to allow him to write.

Mobility Aid

SOLUTION: Arm rest/positioner
An electrically driven arm rest and arm positioner for his right arm was constructed and motivated by a switch mechanism operated by his left hand. The device performed so well that the client was able to perfect a legible handwriting. The switch mechanism controls three motions: 1) horizontal at the shoulder, 2) horizontal pivot at the elbow, and 3) vertical pivot of the forearm. FFI #6

C-01
ALS
Quadriplegia
Eating

PROBLEM: Unable to signal caregiver to regulate feeding speed
A woman who is totally paralyzed from amyotrophic lateral sclerosis needed a communication device to signal the person feeding her to regulate the flow of intake.

Signaling Device

SOLUTION: Message selector with eyeglass switch
IMPART provided a Prentke Romich message selector (electronically operated backlighted messageboard) on a loan basis. A special eyeglass-mounted switch was also made available. This assembly provided an adequate means of communication for her while eating or drinking. The Alphabet Message Scanner with Memory is available from Prentke Romich, Box 191, Shreve, OH 44676, for approximately $600. FFI #13

C-02
Deafness
Hearing Alarm Clock

PROBLEM: Inability to hear alarm clock
Deaf individuals need non-auditory means of being awakened.

Sensory Aid

SOLUTION: Digital clock with bed vibrator
A digital clock with a receptacle on the back for a bed vibrator is available from Hellertronics, 1038 Janero Dr., Santa Rosa, CA 95401. Cost; clock is approximately $23.00, vibrator, approximately $19.00. FFI #12

C-03
Deafness
Hearing Baby Cry

PROBLEM: Inability to hear baby cry
Deaf parents need visual systems to alert them when the baby is crying and in need of attention.

Sensory Aid

SOLUTION: Vibra-Lite/Strobe
IMPART acquired and demonstrated the Vibra-Lite, a commercially available alerting device consisting of a sound detector and a stroboscopic lamp. Available from Vibra-Lite Products, Inc., 83 S. Highland Ave., Ossining, NY 10562. Cost: approximately $70 for the Vibra-Lite and $40 for the Vibra-Lite Strobe. FFI #13

C-04
Deafness
Hearing Intruders

PROBLEM: Inability to hear intruders
A deaf individual wanted a visual means for detecting when intruders had entered his property, either home or car.

Sensory Aid

SOLUTION: Burglar alarm light system
Project IMPART acquired and demonstated a device which could serve as an intrusion detector if noise were made during a forced entry. Available from Vibra-Lite Products, Inc., 83 S. Highland Ave., Ossining, NY 10562. Cost: approximately 170 for sound detector and $40 for strobe light. The strobe light can also be attached to commercially available systems. FFI #13

C-05
Deafness
Hearing Smoke Alarm

PROBLEM: Inability to hear smoke alarm
Commercially available smoke alarms use bells or other auditory signals as alerting devices. Deaf people need a visual signal for this purpose.

Sensory Aid

SOLUTION: Strobe lights
Commercially available smoke detector systems can be outfitted with strobe lights instead of a bell. Bids can be obtained from contractors and installers. The Smoketron-Detector, costing approximately $75., and the Remote-Receiver, costing approximately $35., are available from Essco Communications, Inc., Division of Diversified Electronic Corp., 4060 Wakefield St., Philadelphia, PA 19144. FFI #13

C-06
Deafness
Hearing Telephone, Doorbell

PROBLEM: Inability to hear telephone, doorbell
Deaf individuals need visual means for knowing when their doorbells or telephones are ringing.

Sensory Aid

SOLUTION: MAGSAT Phone Ringing Indicator Set
This commercially available system is comprised of a transmitter that detects when a telephone or doorbell is ringing and a receiver that makes a light flash in conjunction with the auditory signal. Receivers may be placed in many rooms or even at a neighbor's house when the person visits there. Available from MAGSAT, 56 Arbor St., Hartford, CT 06106, TTY or Voice (203) 525-4238. FFI #12

C-07
Vocal Cord Damage
Speaking

PROBLEM: Inability to speak above a whisper
A client had suffered severe damage to his vocal chords. The damage was irreversible and forced him to speak by whispering. This limited his range and since he was an instructor it diminished his effectiveness in lecturing. It also, of course, handicapped him in his personal life.

Amplifier

SOLUTION: Personal voice amplification system
The device was designed and built by the Biomedical Engineering Department at the Institute for Rehabilitation and Research. It consists of a miniaturized amplifier and speaker and a small plug-in microphone. The amplifier-speaker piece can be dropped into a shirt pocket, or clipped to belt or dress. The microphone can be attached to the frame of eyeglasses, worn with an ear piece suspension, or an over-the-head clamp.

The voice impaired man reported enthusiastically on the results. For the first time ever, he is able to converse with his wife while he is driving a car and she is a passenger. Classroom results are good. Some difficulty was encountered with feedback but this was countered by proper location of the speaker and controlling the volume. FFI #6

C-08
Cerebral Palsy
Dysarthria
Speaking

PROBLEM: Unable to articulate understandably
A VR client with cerebral palsy whose speech is not understandable has the goal of operating a bookstore and he needs to be able to communicate effectively with his customers.

Communication Aid

SOLUTION: Voice synthesizer, scanning messageboard
It was recommended that the client consider either the HC Handivoice voice synthesizer or an electronic scanning messageboard. The Handivoice, and the Prentke Romich message selector were suggested. The Handivoice is available from HC Electronics, Inc., 250 Camino Alto, Mill Valley, CA 94941 for approximately $2200. The Alphabet Message Scanner with memory is available from Prentke Romich, Box 191, Shreve, OH 44676 for approximately $600. FFI #13

C-09
Deafness
Speaking

PROBLEM: Inability to talk to hearing people who don't sign
Deaf individuals are constantly confronted with the need to converse with hearing people who don't sign in situations where no interpreter is available, on the job and in their personal lives.

Sensory Aid

SOLUTION: The Talking Pocket
This commercially available device is worn on the shirt pocket, blouse, or lapel. When words are typed on the VIP (small portable TDD), they appear on the Talking Pocket as well for the "listener" to read. Available from Automated Data Systems, Inc., P.O. Box 4062, Madison, WI 53711, for approximately $50.00. (VIP available from same vendor for approximately $180.00.) FFI #12

C-10
SCI
Quadriplegia
Telephone Dialing

PROBLEM: Unable to dial telephone
A large number of quadriplegic workers have difficulty using dial telephones which are ordinarily in use at their work sites.

Dexterity Aid

SOLUTION: Telephone dialing systems
There are many solutions to this problem, depending on the functioning of specific muscle groups. Many persons with quadriplegia have good arm movements but lack finger dexterity. Push button phones are generally easier to use than dial, but hand gripping devices with rubber tips can be used with both push buttons and dials. For those with lesser movement, other commercial dialing devices are available. Rehab-a-phone is operated by microswitches that can be placed in a variety of positions and is available from Seegar-Williams, Inc., 4 Norman Street, Bridgeport, CT 06605. Automatic dialers can dial 400 to 1,000 numbers preset by names. Magicall, 1811 W. Katella, Room 118, Anaheim, CA 92804, sells this system. Call or write for cost data. FFI #4

C-11
Cardiac, Epilepsy, etc.
Acute Illness Episodes
Telephone Dialing

PROBLEM: Unable to dial phone in medical emergency
People suffering from heart problems, epilepsy, or other conditions which may occasionally necessitate emergency medical attention may be unable to dial a telephone number during a crisis episode.

Emergency Device

SOLUTION: "Microalert"
This is a commercially available dialing device that will call a specific number or sequence of numbers automatically when activated by a squeeze. It is a small transmitter that activates a preset telephone dialing system. It is available from Microalert Systems International, 3029 San Fernando Road, Burbank, CA 91504 on either a sales or rental basis. Rental cost is approximately $40.00 per month. FFI #4

C-12
Deafness
Telephoning

PROBLEM: Inability to communicate by telephone
Deaf individuals need non-auditory means for discerning what is being said to them by telephone. In addition, those who lack clear speech need means by which their messages can be faithfully communicated to hearing telephone listeners as well as to other deaf persons.

Sensory Aid

SOLUTION: TDD
Telecommunications Devices for the Deaf (TDDs) are keyboard machines allowing visual communications over telephone lines. The TDD category includes both stationary and portable teletypewriters (TTYs) which print messages on paper, and devices with electronic visual readouts that provide no hard copy. Most available stationary TTYs were developed for Western Union Telegraph Co., AT&T, and the

U.S. Government. They are surplused/donated to Teletypewriters for the Deaf, 814 Thayer Ave., Silver Spring, MD 20910, voice/TTY (301) 588-4605. All require the addition of an acoustic coupler to use them over telephone lines. Numerous lightweight portables are commercially available, such as the Porta Printer, Teletyrm, and the MEM/P. In addition, numerous TDDs that use light emitting diodes to form alphanumeric displays are available under such brand names as MAGSAT, MEM/D. Pocket-Phone, Porta-Tel, VIP, and VIDCOM II. Their disadvantage is that they don't allow for reading an entire sentence at a time for deaf persons who have limited grasp of English. Video tube display TDDs are reasonably portable (8 — 25 pounds) devices allowing several lines of communication to be displayed at the same time (C-Phone and TV Phone). FFI #12

C-13
Deafness
Telephoning

PROBLEM: Need for relatively inexpensive TDD with large readout
A deaf individual sought a recommendation from Project IMPART for a less expensive TDD than those he knew about, and which has a larger visual display.

Sensory Aid

SOLUTION: Porta-Tel
IMPART located a commercially available device meeting these requirements called the Porta-Tel, available from: Specialized Systems, Inc., 215 S. Highway 101, Suite 203, Solana Beach, CA 92075. Cost is approximately $400. FFI #13

C-14
Deaf/Blind
Telling Time

PROBLEM: Unable to hear Braille wristwatch alarm
A deaf/blind VR client sought an alarm wristwatch which he could use.

Sensory Aid

SOLUTION: Braille watch with tactile alarm
IMPART found that a braille watch with a tactile alarm (Model CM40) is available through the American Foundation for the Blind, Aids and Appliances for the Blind and Visually Impaired, 15 W. 16th St., New York, NY 10011 for approximately $76. FFI #13

C-15
Deafness
Traveling

PROBLEM: Need for miniature TTY
Deaf individuals who travel a great deal for business or pleasure need very small portable TTYs for calling home, making business contacts, etc.

Sensory Aid

SOLUTION: The VIP
This commercially available TDD is small enough to carry in a pocket, purse, or briefcase, weighs 9 ounces, and will work with TTYs, MCMs, MAGSATs, Teletyrms, or any TTY Network unit. It is available from Automated Data Systems, P.O. Box 4062, Madison, WI 53711, for approximately $180.00. FFI #12

C-16
Cerebral Palsy
No Speech, Poor Coord.
Typing

PROBLEM: Unable to use head stylus for typing
Cerebral palsied individuals lacking speech capabilities and also unable to operate a typewriter accurately, even with a head stylus, need an affordable device which will allow them to communicate by typewriter.

Communication Aid

SOLUTION: Row column scanning typewriter
A row column scanning device was designed and interfaced with a commonly available teletypewriter. The scanner consists of the letters and symbols displayed on a six by six matrix. The scanner

begins scanning the rows, beginning with the uppermost. The row display lights step through the rows until the client activates the switch, causing the selected row to remain lit. The scanner begins scanning the columns. When the desired symbol is at the row-column intersection, client again activates switch. This stops scanning and initiates a print command that is sent to the typewriter interface. This initiates a print complete command which clears all counters so operation can begin anew. Symbols are arranged so that access time is proportional to English usage frequency. The single switch may be any configuration convenient to the operator. Scanning frequency may be controlled by operator by a potentiometer located on the external surface of the scanner. FFI #1

H-01
Post-Polio
Paraplegia
w/Quadriparesis
Cooking

PROBLEM: Unable to operate standard mixer
A housewife who uses a wheelchair and has only limited use of one arm found that most mixers are far too heavy for her to operate. Also, bowl turning was impossible.

Kitchen Aid

SOLUTION: Lightweight mixer
An extremely lightweight commercially available mixer was discovered in the Krups 3 Mix 3000 System, which has the added feature of automatic bowl rotation. Imported from Germany, it is available in department stores thoughout the U.S. It is significantly more costly than other home use mixers; $80 at time of 1978 purchase, compared with $40 for a Mixmaster brand. FFI #7

H-02
MD
U.E. Weakness
Cooking

PROBLEM: Rented apartment precludes architectural changes in kitchen.
A woman disabled by muscular dystrophy uses a manual wheelchair and lives in a rented apartment. She has difficulty using the sink and stove and reaching into cupboards. The landlord doesn't want any major changes.

Mobility/Position Aid

SOLUTION: Commercial aids and proper placement of equipment
An electric powered wheelchair with a removable leakproof wheelchair tray is a great aid in carrying hot food or plates, glassware, etc. Its use makes it easy to use a vacuum cleaner. Lower accessory tables can be used with electric frying pans, crock pots, portable ovens, etc. Usually the doors in front of the sink can be removed and stored for later use. Removable swing-away foot rests will allow closer approach to the sink. An old-fashioned dishpan can also be used on accessory tables. A variety of reachers can be used to reach items on shelves. Plan location of all items on frequency of use and reachability. The use of a mirror over the stove is helpful but regular height stove surface has its hazards. FFI #4

H-03
MD
General Weakness
Home Management

PROBLEM: Inability to stand
A woman who has muscular dystrophy finds it is difficult for her to achieve and maintain a standing position. She was evaluated at her home to determine what applications of technology could be employed to increase her independent activities and security.

Mobility Aid

SOLUTION: Recommended modifications
At the time of this referral, the client was using the Ortho-Kinetic lift wheeled chair. Once the seat angle was adjusted to mid-range and she was shown how to adjust the seat, she was able to accomplish standing and sitting without assistance. Now that she can stand at will, she will be engaging in activities like cooking and doing the laundry. To enhance her independent mobility within the house, it was recommended that a stair lift or wheelchair lift be installed between the first floor and basement. This would allow her access to the downstairs laundry room, safe movement up/down in the house, and access to the outdoors through the garage. The addition of an electric garage door opener and the installation of a brake extension and headlight dimmer switch on the steering post of the sedan she now drives would give her completely independent movement into and out of the house. To enhance her safety and security within the house, the following items were recommended: (1) grab bars in the shower; (2) a medical emergency call system; and (3) smoke detectors. FFI #10

H-04
Cerebral Palsy
Dysarthria

PROBLEM: No intelligible speech
A former resident of a housing facility for people with disabilities became employed and lost his eligibility for special housing. He moved to a nearby apartment house so he could at least purchase the needed support services from the residence. His only problem was being able to convey emergency messages to the switchboard operator of the residential unit.

Communication Aid

SOLUTION: Non speech emergency communication
A memory telephone was installed in his apartment, which allowed him to choose a canned number that would automatically dial the housing unit switchboard. He was also given a cassette tape recorder and six prerecorded tapes deemed appropriate for his daily needs. They were coded pictorially so he could select the proper tape. The tapes had very little leader on each end and were recorded on both sides. They were inserted into the recorder when needed and played into the telephone transmitter. The messages are repeated twice on each side of the tapes, and the recorder has an automatic stop feature.
FFI #1

H-05
Osteogenesis Imperfecta
Short Stature;
Paraplegia
Household Management

PROBLEM: Unable to reach household appliances and furnishings
A woman born with a fragile bone condition, who has a history of many fractures, is paraplegic and approximately two and a half feet tall. Her short stature plus use of wheelchair make it difficult to impossible for her to reach to cook and perform other household chores. She has good use of her upper extremities, however.

Mobility Aid

SOLUTION: Elevating Tiny Tot wheelchair
The REC at Northwestern University designed an adapted wheelchair for her use, with elevating capabilities. Its components included: an E&J Premier Tiny Tot wheelchair with removable arms, high seat, and one piece footboard, less armrests, seat and back upholstery, and rear wheels; a quick disconnect removable seat (the seat shell was molded of a chopped fiberglass reinforced resin with foam cushioning and fabric upholstery); manually controlled seat rotation; drive motors and wheels from the Abec wheelchair; proportional hand controller (Abec) in which was mounted the power on-off button and seat elevation button; elevating actuator (Motion Systems); a quick disconnect battery (two 12 volt, lead acid, GEL-CELs); locking storage compartment in left armrest; and a safety switch mounted in the seat cushion. This switch eliminated the chance of an accidental start up while she was transferring or reaching, since she had to be properly positioned in the wheelchair before the power would be activated. The heights of her bed, tub seat, and toilet seat were then raised to be level with the lowest wheelchair elevation. The wheelchair charging system was rewired so she could make the necessary connections from her bed. Reacher tongs were also provided. The solution not only increased her independence at home as planned, it opened up vocational possibilities for her. FFI #9

M-01
L.E. Amputee; Bilateral Ramp Use

Wheelchair

PROBLEM: Unstable wheelchair on steep ramps
A worker must propel himself in a regular adult wheelchair up a steep ramp each day to get to work. He is a double amputee who doesn't wear prosthesis. His chair tends to tip. He wants to add weight to the front wheels.

SOLUTION: Amputee wheelchair
Each ounce of weight added to the chair increases energy expenditure. This counts up at the end of a long day. An amputee model wheelchair in which the rear wheels are set back is suggested. This provides a longer wheel base and gives the wheelchair more stability on ramps. FFI #4

M-02
Paraplegia
Stair Climbing

Elevator

PROBLEM: Unable to climb stairs
A person who uses a manual wheelchair lives on the second floor of a two story house. The local elevator sales company doesn't have a satisfactory solution to his getting up the staircase which, incidentally, has two landings.

SOLUTION: Powered device to transport person up and down stairs
First floor living quarters are much more suitable for disabled persons because mechanical devices and elevators do not behave well during fires. Two exits should be available to disabled persons. The WESCOLATOR, made by Cheney Co., 7611 North 73rd Street, Milwaukee, WI 52335, can be used in conjunction with landings. The person must be able to transfer himself upward about 6" to get on the device. An extra wheelchair is necessary on the second floor for his use as the device does not transport wheelchairs. The "elevator" seat is 26 inches high. Costs vary with the number of steps and landings. FFI #4

M-03
M.D.
Paresis
Stair Climbing

Elevator

PROBLEM: Unable to climb stairs
A muscular dystrophy handicapped person with a chronic back problem was unable to manage a flight of seven steps from her porch entrance down to her automobile in the morning on the way to work. The return problem was equally difficult.

SOLUTION: Mechanical lift
A mechanical lift was installed at her home so that she could ride the platform up or down while either standing or sitting in a wheelchair. The lift was installed by Houston Independence Through Engineering — HITE, P.O. Box 57843, Webster, TX 77598 for approximately $1410. FFI #6

M-04
Any Etiology
Paraplegia
Cushion Replacement

Positioning Aid

PROBLEM: Wheelchair cushion replacement
A counselor asked for guidance on when wheelchair-user clients should replace their wheelchair cushions.

SOLUTION: Replacement with cushion to fit individual needs
The basic function of a wheelchair cushion is pressure distribution over a large area. Pressure sores develop in areas where there is a lack of tissue padding over bony prominences. Other features to consider are weight of cushion, heat and moisture exchange and stability. Cushions of foam rubber and other foam materials slowly lose their resistance and pack down so that they fail to protect potential sites for

pressure sores. No cushion can be relied upon to protect fully from pressure sores. One method of fitting utilizes a medium density cushion as a fulcrum, utilizing part of the weight of the lower extremities as a counter force to lower pressure on the bony prominences. Cut out portions also help if they are not circular. Changing positions for at least partial release of pressure is required for prevention of pressure areas. Dail inspection with mirrors is recommended. Provide new cushions on request. The user knows when the cushion needs replacement. FFI #4

M-05
Quadriplegia
Wheelchair Operation

PROBLEM: Unable to operate electric wheelchair
In a high quadriplegic, residual muscle control was not adequate for conventional chin operated control of an electric wheelchair.

Dexterity Aid

SOLUTION: Photo electric controls
The controls of a conventional wheelchair were replaced with an eye activated photo electric system. The user can select the mode of operation or direction (forward, reverse, stop, right, or left) by simply forcing a hard stare in the right segment of vision. The photo electric devices are mounted on the eye frames of a pair of eyeglasses. FFI #6

M-06
Spinal Muscular Atroph
Wheelchair Propulsion

PROBLEM: Unable to operate motorized wheelchair controls
A 21 year old woman with spinal muscular atrophy is unable to control her wheelchair independently. She has very limited shoulder and arm function. However, she does have use of her index and middle fingers on the right hand.

Controls

SOLUTION: Arm cradle and lapboard switches
Project Threshold engineers designed and fabricated microswitches which were mounted horizontally on the client's lapboard. A plexiglass cradle was fabricated to hold her right arm in a comfortable position while using her index and middle fingers to operate the switches controlling her wheelchair. FFI #14

M-07
Any Etiology
Requiring Electric Wheelchair
Wheelchair Usage

PROBLEM: Inability to afford standard electric wheelchair
The cost of standard electric wheelchairs is out of range for many individuals. A cheaper and lighter weight version was needed.

Mobility Aid

SOLUTION: Standard-to-Electric Wheelchair Conversion Kit
A Standard-to-Electric Wheelchair Conversion Kit has been devised. By replacing the handles with rechargeable battery packs and the brakes with a friction motor-drive arrangement on each side, a manual wheelchair can be simply converted to a secondary purpose electric wheelchair. It is lightweight and low cost. FFI #6

M-08
Leg Fracture
Non-ambulatory
Wheelchair Usage

PROBLEM: Heavy leg cast immobilizes worker
Following a leg fracture, a worker had a heavy cast which she had to wear for six weeks. She could return to work if she could use a wheelchair, but she works at a table and the leg with the cast cannot hang down.

Positioning Aid

SOLUTION: Bolt-on leg support on rented wheelchair
Any local wheelchair vending company can rent a wheelchair with a bolt-on leg support. Outriggers should be added to the wheelchair to aid in going up and down ramps safely. FFI #4

R-01
U.E. Weakness
Poor Grip
Billiards

PROBLEM: Inability to grip and propel standard billiard cue
When a player is unable to properly hold and propel a standard billiard cue in a coordinated manner, he may be unable to properly play billiards, may damage the billiards tabletop or may injure himself.

Dexterity Aid

SOLUTION: Spring-loaded billiards cue
This design utilizes a unique light-weight aluminum cue, 50" or 58" long, designed for use by even severely disabled individuals. When user pushes the cue tip against any firm surface, the unit is ready to use. He then aims and releases via control switch at the end. The cue does the rest. The device is available under the brand name "Quad Pod" from North American Recreation Co., P.O. Box 758, Bridgeport, CT 06601 (203) 336-2151, or A to Z Industries 118112-5 Bryand Street, Northridge, CA 91324, for approximately $46.00. FFI #8

R-02
Any Etiology
U.E. Impairment
Billiards

PROBLEM: Inability to propel billiard cue accurately
When a player is unable to hold or propel a standard billiard cue in a coordinated manner, skill development and enjoyment of the game are impeded.

Mobility Aid

SOLUTION: The Murphy Bridge
The design of this commercially available device uses a light weight, durable stick cue that enables the player to shoot billiards with complete independence whether s/he uses one arm only, plays from a wheelchair, or uses other non-standard playing patterns. It attaches to any standard cue, disassembles to fit into a cue case, and has a non-skid rubber side which enables shots to be made from the edge of the table. Available from Charlton Manufacturing, 3511 Highway D, West Bend, WI 53095, (414) 334-7391 for approximately $18. FFI #8

R-03
Any Etiology
Grip Impairment
Bowling

PROBLEM: Unable to hold bowling ball by finger holes
When a player is attempting to roll the ball it is essential to be able to properly grip it. If this is not done, the bowling balls, which are heavy, drop from the player's grip and could either cause injury or damage the floor, not to mention obstructing the development of skills and the player's enjoyment of the activity.

Dexterity Aid

SOLUTION: Design of a bowling ball with a special gripping device
The design allows the player to grasp the ball without the usual finger hold grip. Finger holes have been replaced by a spring-loaded hand grip. Simply grasp the handle, roll the ball and the handle retracts flush into the ball. The bowling ball is made of the highest quality rubber and comes in either 10 pound, 12 pound, 14 pound or 16 pound weights. For approximately $73.00, this device is available from the North American Recreation Company, P.O. Box 758, Bridgeport, CT 06601, (203) 336-2151. FFI#8

R-04
U.E. Function Impaired & Wheelchair Use
Bowling

PROBLEM: Unable to propel bowling ball from wheelchair
Wheelchair users with limited upper extremity strength and coordination may find that they frequently drop the ball, interfering with their enjoyment of the game and, perhaps, causing damage to the floor.

Mobility Aid

SOLUTION: Wheelchair bowling ramp
The design is such that even very severely disabled can participate in bowling. Attendant (fellow player) places ramp in position; ball is then placed on ramp and pushed for ball release. The momentum carries the ball down the alley into the pins. It may also be used from a standing position. Strong, light-weight chrome plated steel that is strong and durable and can be dissembled into two pieces for easy storage and transporting. This is available from the North American Recreation Company, P.O. Box 758, Bridgeport, CT 06601, (203) 336-2151, for approximately $73.00. FFI #8

R-05
Any Etiology
Wheelchair Use
Bowling

PROBLEM: Unable to hold bowling ball and propel chair
When a player approaches the bowling line, s/he must use both hands to propel the chair. Since bowling balls are heavy, they tend to roll from the player's lap and damage the floor.

Positioning Aid

SOLUTION: Wheelchair bowling ball holder
The design incorporates an on-off quick attachment to the wheelchair. A circle of metal slightly smaller than the ball holds it securely over the lap area until it is needed. With this arrangement, it does not interfere with arm swing in launching the ball. Available from North American Recreation Co., Box 153 Fairhaven Station, New Haven, CT 16513. Write for cost. A similar device is sold by George Snyder, 5809 N.E. 21st Ave., Ft. Lauderdale, FL 33308, for approximately $10.00. FFI #4

R-06
Paraplegia
Cycling

PROBLEM: Unable to ride a bicycle
When paraplegics wish to ride bicycles, they cannot as a bicycle is designed to be motivated by foot pedals. A less disabled individual also has difficulty properly balancing on a bicycle.

Mobility Aid

SOLUTION: Hand operated tricycle
The design is a hand operated tricycle engineered for individuals who depend on their hands and arms for mobility. All controls are easily accessible and light weight construction allows for easy pedaling. Standard equipment includes 5 speeds, a dual braking system, independent rear supports, and adjustable seat and leg supports. The device is available under the brand name "Centauri" from Tri-World Industries, 16015 West 5th Avenue, Golden, CO 80401 for approximately $600.00. FFI #8

R-07
Any Etiology
Paraplegia
Cycling

PROBLEM: Unable to use legs for cycling
Standard motorcycles/mopeds require active use of the lower extremities for mounting and balancing. However, many paraplegics wish to enjoy the experience of cycling.

Mobility Aid

SOLUTION: "Tri-ped"
The design of the Tri-ped incorporates a three wheel design 75 inches long, 36 inches wide, and weighing 140 pounds. It has a 1.5 horse-power 49cc motor and gets approximately 100 miles per gallon. This moped will accomodate two passengers, has an electrical start and a reverse gear, and can be fully hand operated. It is available from American Tri-ped Corporation, 113 Marine Street, Farmingdale, NY 11735 (515) 752-9229, for approximately $900.00. FFI #8

R-08
Any Etiology
Paraplegia
Tricycling

PROBLEM: Inability to vacate wheelchair for cycling
Numerous wheelchair users would like to enjoy cycling, but either cannot or prefer not to vacate their wheelchairs in order to do so. Some wish to use a cycle for transportation as well as recreation, and need their wheelchairs to use when they arrive at their destinations.

Mobility Aid

SOLUTION: Try-Cycling
The design of this commercially available device incorporates a special sidecar for the driving of a motorcycle from a wheelchair. It uses a Honda Model CB-400 Hawk Automatic motorcycle. The sidecar, a platform designed to accomodate a wheelchair, has mounted on it the steering, clutch, accelerator, and braking controls necessary to operate the motorcycle. The system can be individually modified and has optional equipment available. An able-bodied companion can ride on the motorcycle seat. Available from Tomco Enterprises, Inc., 7701 Hoover Road, Valley Center, KA 67147, (316) 264-8086, for approximately $1800 (sidecar only) or $3400 (sidecar and motorcycle.) FFI #8

R-09
Any Etiology
L.E. and Trunk Function Impairment
Horseback Riding

PROBLEM: Inability to maintain balance while riding horseback
People with paralysis patterns impairing lower extremity function and trunk support are unable to enjoy horseback riding using a standard saddle since these muscles are needed to stay mounted.

Positioning Aid

SOLUTION: Support saddle with safety straps
A commercially available support saddle was designed for disabled riders 12 years of age and older who have severe spinal or muscular disorders. It has been successfully used by people with muscular dystrophy, spina bifida, cerebral palsy and spinal cord injury. It is constructed of fiberglass — reinforced plastic and leather, and a padded headband are also provided. It is basically a bucket seat with a wrap around support with safety straps. Available from Maddak, Inc., Penquannock, NJ 07440, for approximately $550.00. FFI #8

R-10
Low Vision
Horseback Riding

PROBLEM: Keeping eyeglasses in place while horseback riding
A client with low vision needed a device to hold his eyeglasses in place while horseback riding.

Positioning Aid

SOLUTION: Headband
A headband for this purpose is used by athletes who must wear their glasses during athletic activity, and is available in local optical stores. FFI #13

R-11
Any Etiology
L.E. Function Impaired
Ice Skating

PROBLEM: Inability to balance, maneuver safely/skillfully on ice skates
Individuals with weak lower extremity muscles or a significant degree of spasticity may be able to ice skate, but with some risk to their safety and/or impedance of the pleasure derived from skating.

Positioning Aid

SOLUTION: Specially designed support aid for disabled ice skaters
This support aid utilizes a tubular, light-weight metal design that provides support, safety, and enhanced enjoyment for users who have sufficient leg support with braces, special boots, etc. The device collapses for ease of storage and transportation, and comes in sizes for children and juniors as well as adults. Information on cost and appropriate usage is available from Hein-A-Ken Corporation, P.O. Box 56, Thief River Falls, MN 56701, (218) 681-2147. FFI #8

R-12
Any Etiology
U.E. No Use
Painting

PROBLEM: Unable to use arms for painting
Many individuals who have totally paralyzed or absent upper extremities wish to paint or sketch as a creative outlet.

Positioning Aid

SOLUTION: Modified mouthstick brush holder
The design is dependent on good trunk motion and strength and uses a light-weight mouthstick, usually made of balsa wood. The user is instructed to, "Warm the mouthpiece and imprint your teeth; hold the device in the mouth and use your tongue to open the gripper grasp." Available from Cleo Living Aids, 3957 Mayfield Road, Cleveland, OH 44121, (216) 382-9700, for approximately $34.00. FFI #8

R-13
Stroke
Hemiplegia
Pasting

PROBLEM: Unable to hold materials for cutting and pasting
A newspaper reporter who retired after having a stroke which left him hemiplegic wanted to continue his hobby of making scrapbooks of news articles relating to subjects of interest to him. He found that cutting and pasting, and even writing a few words of explanation beside each clipping were extremely difficult for him as he has no ability to use his paralyzed arm and hand as a "holding device".

Holding Aid

SOLUTION: Metal cookie sheet with magnets
He solved his own problem by coming up with the creative idea that a flat metal cookie sheet could serve as his work surface so that he could use magnets to hold the paper as he cut, pasted, and wrote. Following a television program on disability-related issues, he called in to the station to share his idea. It has proved helpful to others not only in arts and crafts activities, but in correspondence, hand lettering, etc. FFI #7

R-14
Any Etiology
Grip Impaired
Playing Ball Games

PROBLEM: Inability to grip racquets and other sporting devices
Individuals otherwise able to participate in wheelchair bowling, billiards, softball, tennis, or other ball games may be impeded from doing so by inability to grip a racquet, cue, assistive bowling device, softball bat, etc. adequately.

Dexterity Aid

SOLUTION: Rancho Activity Mitt
The Rancho Activity Mitt is attached via velcro straps to the hand; wrapping its finger thongs around the specific piece of sporting equipment. Not yet commercially available, it was developed at Rancho Los Amigos Hospital for distribution to out-patients. FFI #8

R-15
Polio, Amputation, LE
Balance Poor
Skiing

PROBLEM: Inadequately designed stand and ski poles for disabled skiers
When a skier with a lower extremity amputation or other balance problem is attempting to properly balance and steer in a safe and independent manner, s/he will be unable to use standard ski poles.

Positioning Aid

SOLUTION: Outrigger ski poles
The design uses outriggers at the end of the pole rather than sharp pointed tips of the standard ski pole. The tip flips up into the vertical position when the skier needs to use it as a crutch for support while walking. Outrigger skis resemble ski poles with little skis on the end and are used to guide/steer, as well as provide balance assistance for the skier. This device is available under the brand name Fupski from: Pauls Sports, Inc., Route 1, Box 615 P, Excelsior, MN 55331, for approximately $118.00. FFI #8

R-16
Quadriplegia
Swimming

PROBLEM: Inability to enter swimming pool
A quadriplegic VR client sought information on cost specifications and availability of swimming pool lifts which he could use.

Mobility Aid

SOLUTION: Hoyer Lift
IMPART found that the Hoyer Swimming Pool Lifter is a suitable device. It is available from Everest and Jennings, 1803 Pontius Ave., Los Angeles, CA 90025, for approximately $400.00. FFI #13

R-17
Paraplegia
Water Skiing

PROBLEM: Unable to balance and support body to water ski
Due to lack of strength in the lower extremities, individuals may be unable to support their bodies and utilize standard design water skis safely and independently. This denies some an opportunity to participate in water sports, and for others the safety of the individual is the critical factor.

Mobility Aid

SOLUTION: Seated water-skiing
The design utilizes two regular water skis spaced about two feet apart and connected by heavy tubing to which a seat is attached. The device is maneuvered by simply tilting the seat which mechanically turns the skis. Frame is 16 gauge 1" diameter steel tubing with a baked enamel finish. Hinged joints have neoprene bearings. Seat is vinyl-covered deep foam cushion. Overall size is 31" x 69" x 15" high, and weighs 29 pounds. Special 72" tow rope with 12" bar, float, hitch ring and bridle are included. The device is available under the brand name "Aqua-Bat" from: Gander Mountain, Inc., c/o Outdoor Sportsman's Supplies, P.O. Box 298, Wilmot, WI 53192, for approximately $105.00. FFI #8

T-01
Amyotonia Congenita
Quadriparesis
Art Therapy

PROBLEM: Extemity function limited to slight movement right arm
As a result of amyotonia congenita, a young woman has quadriparesis with only slight movement of her right arm. She was referred to the VAPC's Clinical Engineering Center for evaluation as she was attending college with the goal of becoming an art therapist. Although full follow up is not available on their recommendations, they are presented here as an excellent illustration of the range of technological issues which must be considered in such a case.

Environmental Controls

SOLUTIONS: Recommended instrumentation
The following technical aids were recommended to help her achieve a level of independence and security in her apartment and to utilize her abilities in performing her vocation: (1) A powered, fully-reclining wheelchair operated by a sensitized, proportional joystick control that requires approximately one-quarter inch excursion for control from neutral to top speed and is adaptable to changes in control site (e.g., held in the hand, placed in a receptacle on a lapboard, or situated on a bracket for chin operation). (2) An easily removable lapboard constructed so that when it is secured to the wheelchair armrests, it is at a height of six inches from the seat; it has foam pads on both sides for resting the arms; it holds a fully automatic cassette recorder and an automated holder for a mouthstick; and it has quick disconnects for any electrical connections. (3) An environmental control system installed in the living room (work area), operated through a pneumatic control and a supplementary RF transmitter mounted on her wheelchair, to give her control over existing appliances as well as an automatic dialing telephone and an automated work table (described below). A second environmental control system installed in the bedroom, operated through a pneumatic control, to allow her to operate adapted appliances already in that room as well as an additional automatic dialing telephone. (4) An automated work table, height adjustable from 26 inches to 34 inches, comprised of a single motorized turn table in the middle with a mouthstick controlled file tray; a flat desk on one side where the environmental control system, telephone, etc., can be located; and a motorized tilt desk on the other side with a working surface of at least 36 inches by 36 inches for her art work. (5) A portable, automatic reader, such as the Saltus Reading System, which is an automated scroll that allows any type of reading material to be viewed and can be operated with a company supplied mouth control or through the environmental control system. (6) Bilateral forearm orthosis of the swivel or parallelogram type with the right arm orthosis motorized to extend her reach for the performance of work and daily activities. (7) A security package comprised of smoke/heat detectors; a dual channel automatic telephone dialer that would be activated in fire or medical emergencies; a three-station intercom allowing communication between the bedroom or work area with someone outside the apartment door, and a surface mounted, dead bolt, solenoid lock on the apartment door. In addition to this system, the existing apartment intercom should be interfaced to the environmental control system to allow her to speak to and admit callers who are downstairs at the main entrance. (8) An automatic door release (opener) to enable her to enter and/or exit the apartment independently. FFI #10

T-02
SCI
Quadriplegia
Attending Classes

PROBLEM: Need for large capacity urine reservoir
A quadriplegic student who uses a wheelchair found the capacity of the conventional urine reservoir inadequate for an extended series of classes.

Urine Collection Device

SOLUTION: 24-hour urine reservoir
A 24-hour urine reservoir was designed and constructed. It stands on the wheelchair base, is spill proof, has baffles, and is odor free. It replaces the conventional reservoir. FFI #6

T-03
Any Etiology
Hand Function Impaired
Calculation

PROBLEM: Inability to operate standard calculator control buttons
Many commercially available calculators have the control buttons so close together that it is difficult or impossible for people with impaired hand use to operate them.

Dexterity Aid

SOLUTION: Big switch calculator
A prototype was tested in two public school classrooms attended by moderately severely disabled junior and senior high school students. It was built aroung the MM5737 calculator chip. A keyboard was designed in which adequate separation and the display was designed using the IEE1720 seven segment display which is one inch high and much easier to see than the conventional display. (Another approach would be to use an off the shelf calculator and parallel the switches with the big switch panel board. One could also parallel the display.) The big switch calculator enabled students to improve their speed as much as 100 percent, and teachers reported a high motivational factor related to its use. FFI#1

T-04
Cerebral Palsy
Quadriplegia
Carrying Books

PROBLEM: Unable to reach books in wheelchair bag
A 20 year old student with cerebral palsy had a problem retrieving carried books in a bag attached to the back of his wheelchair. He had to ask for assistance to retrieve his books and papers.

Mobility Aid

SOLUTION: Lapboard desk
A lapboard desk with a sliding top was designed and fabricated to allow independent access to books and papers. It also provides a convenient writing surface. FFI #14

T-05
Speech Impairment
Classroom Participation

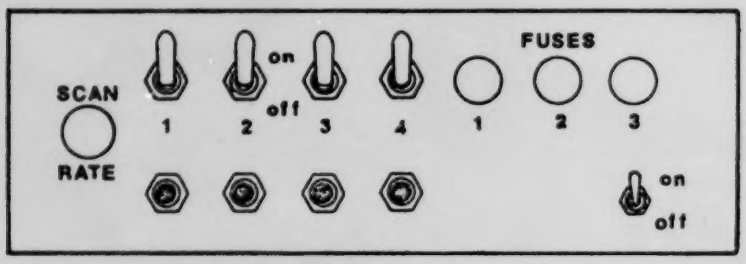
PROBLEM: Unable to speak intelligibly
Severely disabled students with little or no ability to communicate are unable to participate in general classroom discussions in either special school/class or mainstream educational settings.

Communication Aid

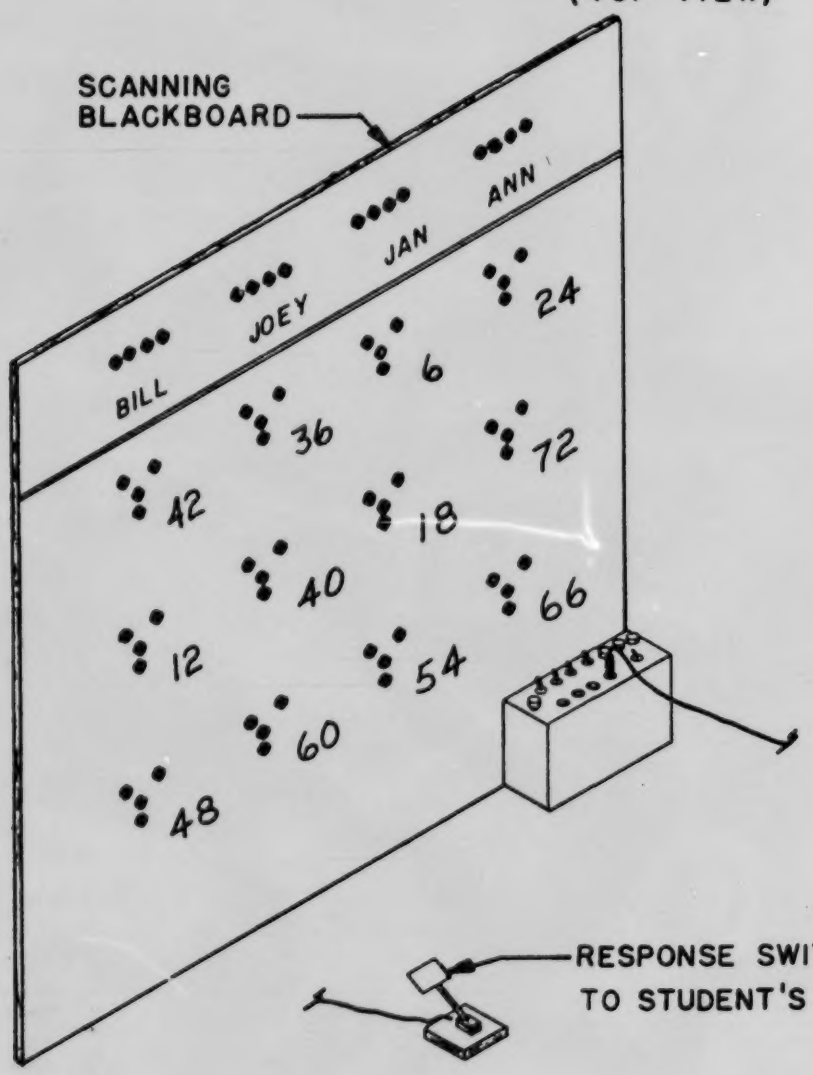
SOLUTION: Scanning blackboard
The board developed is approximately 4 feet square and contains 12 response positions. The upper portion contains 4 sets of 4 lights. The student's name is displayed in this area. The remainder is divided into 12 equal areas, used to write in/otherwise display the desired responses. The scanning is done from left to right in sequence. The scan rate may be varied by a potentiometer from .5 seconds to about 3 seconds per step. The response activator is tailored to the student's needs/movement capabilities. Each activation device is connected through a stereo plug for ease of selection by the teacher. Operation is as follows: the teacher sets up the board for a particular situation and asks a question on the material being studied; s/he selects a student to respond to the question; the lights above that student's name light up and the switching logic sequences the scan operation under the control of the student; student allows scanner to step

through the responses shown until it reaches the one the student thinks is correct; s/he stops the scan by activating the response switch.

FFI #1



CONTROL UNIT
(TOP VIEW)



SCANNING BLACKBOARD

III-29

T-06
Cerebral Palsy
Quadriplegia
College Coursework

PROBLEM: Unable to take lecture notes
Cerebral palsy has rendered this individual functionally quadriplegic. She is a college student who required assistance taking notes in her classes.

Dexterity Aid

SOLUTION: Model A7 Speech Controller
After reviewing her note-taking requirements and available information about portable cassette recorders, it was determined that the Model A7 Speech Controller would best meet her needs. This unit was recommended because it records at conventional speed 1 7/8 IPS, and it can playback from .6 to 2.5 times faster than recording speed while maintaining intelligibility through electronic intervention. This playback feature would allow the client to review a two-hour lecture in less than one hour or slow down the playback to better understand particular details. The unit operates similar to other portable cassette recorders, and it is equipped with these additional features: CUE and REVIEW functions; PAUSE and THRU-PUT (Variable-Speech-Control); levers on RECORD, REVIEW, PLAY, CUE, and STOP (Eject) functions; slide controls for VOLUME and VARIABLE-SPEECH-CONTROL; and built-in condensor microphone plus an extended microphone with an ON/OFF switch. The Model A7 Speech Controller is manufactured by The Variable Speech Controller Company, 185 Berry Street, San Francisco, CA 94107; the cost of the unit including an optional DC 12-volt adaptor for use in a car, an optional carrying case, one-half dozen 60-minute cassettes, and one-half dozen 90-minute cassettes is approximately $350.00. FFI #10

T-07
Infectious Polyneuritis
Quadriplegia
Computer Programming

PROBLEM: Inability to operate video monitor controls
A woman totally paralyzed by infectious polyneuritis enrolled in a home training program for a home-based computer programmer career. She found, however, that she could not independently control the video monitor used to present the course material. This meant that the only time she could work on her lessons was when another person could assist.

Dexterity Aid

SOLUTION: Control modification
The REC at Northwestern University fabricated a plexiglass disc with slots to fit over the existing control knob. Using her mouthstick, she could then independently control the selection switch. FFI #9

T-08
MD
Paresis, Severe
Deskwork

PROBLEM: Unable to reach materials at desk
A student with muscular dystrophy was unable to reach the assortment of books and papers he needed on his home work desk.

Positioning Aid

SOLUTION: Double Lazy Susan desk
A double turntable was designed and constructed to increase several-fold the available working materials for his very limited reach. The table is 30" x 60" with two 24" diameter turntables set flush in the top so that materials can be slid across them. The turntables were balanced to operate with a slight touch. Fabrication cost approximately $360.00. FFI #6

T-09
Hearing Impairment
Hearing Lectures

PROBLEM: Difficulty in hearing classroom lectures
A hearing impaired student needed an amplification system including a remote transmitter to be used by the instructor and a receiver to be used by the student in conjunction with a hearing aid.

Sensory Aid

SOLUTION: The FM Phonic Ear
IMPART identified the FM Phonic Ear as a suitable device. The system consists of a receiver costing approximately $350, a transmitter costing approximately $300, and a pocket stereo charger costing approximately $350. It is available from Herb Dickson, Distributor, H.C. Electronics, P.O. Box 24264, Dallas, TX 75234, (214) 241-0886.
FFI #13

T-10
SCI
Quadriplegia
Typing

PROBLEM: Unable to manipulate typewriter platen
A quadriplegic student was not able to turn the platen on an electric typewriter and could not reverse the typed sheet to make corrections.

Dexterity Aid

SOLUTION: Reverse index mechanism
A low cost highly reliable electrically operated mechanism was built which allows severely disabled persons to reverse index an electric typewriter to previously typed lines. This device fits on a standard electric typewriter and is commercially available. It operates through a friction drive on the knob of the platen and can be activated with a mouthstick. Inquire from HITE, P.O. Box 57843, Webster, TX 77598.
FFI #6

T-11
Cerebral Palsy
Stature Small
Typing

PROBLEM: Unable to reach typewriter keys
A VR client who uses a wheelchair because of cerebral palsy and who is also very small was in training to become a typist. From the low position of her wheelchair, she could not reach the keys well enough to type competently.

Mobility Aid

SOLUTION: Elevating wheelchair
For the term of her training, she was lent a SCAT Electric Elevating Executive Chair manufactured by General Teleoperators, Inc., P.O. Box 3584, Los Amigos Station, Downey, CA 90242 (cost, approximately $2200). The chair satisfied her training needs, but whether one will be prescribed for purchase depends on the requirements of the job she eventually acquires. FFI #13

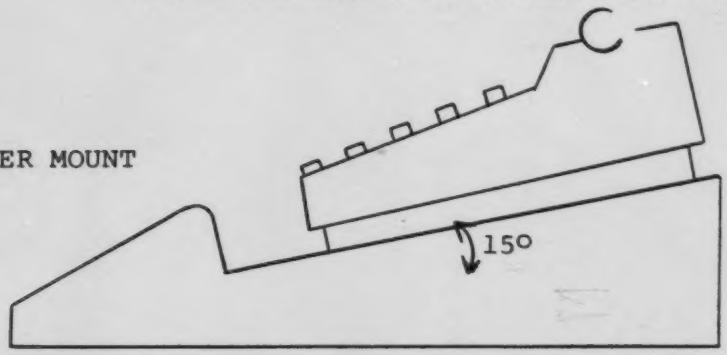
T-12
Cerebral Palsy, Athetoid
Quadriplegia
Typing

PROBLEM: Unable to reach typewriter keyboard
A young man with cerebral palsy, athetoid type, was enrolled in a city college freshman program. Functionally quadriplegic, he was unable to reach a typewriter keyboard effectively when placed on an ordinary work surface.

Positioning Aid

SOLUTION: Typewriter mount
A typewriter mount was designed by the REC at Northwestern University which supports his typewriter at an angle of approximately 15° and has an arm support surface in front of it. (See illustration.) FFI#9

TYPEWRITER MOUNT



III-31

T-13
Blindness
Typing

PROBLEM: Proofreading Selectric Typewriter copy
A blind clerical trainee was to obtain training at Goodwill Industries in San Jose on a Selectric style typewriter. Previously available CCTV typewriter attachments have not worked with other than standard typewriters, however.

Sensory Aid

SOLUTION: Visualtek CCTV selectric attachment
A successful prototype (RS-7 Typing Aid System) was delivered to Goodwill, used by the trainee during training, and made available to her when she found employment. It is now commercially available from Visualtek, 1610 26th St., Santa Monica, CA 90404, (213) 828-3453. Cost, approximately $1170.00. FFI #2

T-14
Deafness
Typing

PROBLEM: Unable to hear typewriter margin indicator bell
Deaf students in a vocational typing class needed non-auditory signals to warn them when they were approaching the right margin of the paper. They were using IBM Selectric II typewriters.

Sensory Aid

SOLUTION: Right margin indicator light
An IMPART team member designed and installed suitable right margin indicators utilizing lights as warning signals. A microswitch mounted on a bracket is attached to the Selectric typewriter frame by means of a 1/4" bolt (an existing hole, not in use in the frame is utilized). A three volt battery and a red glowing diode complete the circuit with the microswitch. The diode is attached to a paper clamp and the clamp is attached to the right side of the frame holding the typewriting material. The student is able to insert and bolt the bracket and to remove the bracket from the typewriter. The present bell indicator is not disturbed. FFI #13

P-01
Polio
Bilateral Arm Paralysis
Driving

PROBLEM: Unable to use arms for driving
A worker with bilateral upper extremity paralysis wishes to drive an automobile so he can become a real estate salesman.

Foot Controls

SOLUTION: Automobile foot controls
Over 300 persons with similar upper extremity problems are able to drive by using their feet and legs, with a modification designed and sold by Cameron Enns, 13637 South Madsen Avenue, Kingsburg, CA 93631. The system is considered safe and comparatively non-fatiguing. FFI #4

P-02
SCI
Paraplegia
Driving

PROBLEM: Paraplegic wants to drive stick shift automobile
A person recently sustained a spinal cord injury which left him a paraplegic. He has a sports car with stick shift, and wants to continue to drive this car.

Hand Controls

SOLUTION: Use of automatic transmission
Hand controls for stick-shift cars are not commercially available now. The hand controls installed prior to the invention of the automatic shift were very difficult to keep in perfect adjustment. Release of the clutch to coordinate with motor revolutions often failed with the result of jerky starts and stalled engines. Many stick-shift cars have options for installation of automatic shifting, however. FFI #4

P-03
SCI
Quadriplegia
Driving

PROBLEM: Inability to drive independently
A quadriplegic wants modifications to be made on his 1978 Dodge van which would allow him to drive independently.He has incomplete quadriplegia secondary to a spinal cord injury.

Mobility Aid

SOLUTION: Recommended modifications
The following equipment modifications and additions were recommended to enable him to achieve his goal. To make the van accessible to him, the existing side door will have to be motorized and a fully automatic lift will have to be installed. The controls for the access system should be located in a weather-proof/key locked panel on the outside of the van and in a convenient position near the lift on the inside. A switch for him to raise and lower the lift while he is on it should be on the lift platform or supporting frame in a location that is convenient for him. Since his sitting height is approximately 60 inches and the van's headroom is approximately 57 inches, a 12-inch roof extension with frame reinforcement such as roll bars or a roll cage will be necessary. Hand controls with the push/pull operation that he learned on or the push/right-angle pull operation that most quadriplegics prefer will have to be installed for him to activate the brake and accelerator. The headlight dimmer switch and a horn switch should be located on the hand control. Due to his height, he may need a steering-post extension; and a spinner mount and vertical yoke quad cuff (open end) should be attached to the steering wheel. Mechanical extensions should be made on all dashboard switches and controls including the parking brake and all keys. Since this client's wheelchair seat height is four inches greater than average, he will need an adapted captain's chair with a powered base as well as overhead hanging straps in the driver's position to accomplish transferring himself into the driver's position. An electromechanical tie-down

system will be required to secure his wheelchair while he is driving. The van floor will have to be finished for wheelchair maneuverability, and a manual wheelchair tie-down will have to be installed in the event the client is being transported. Additional adaptations that are needed include: (1) powered windows on the driver's and passenger's sides; (2) dual battery and charge splitter; and (3) citizen's band radio. FFI #10

P-04
Post-Polio
Paraplegia, Arms Weak
Driving

PROBLEM: Paraplegic cannot load wheelchair into two door car
A paraplegic worker can transfer from her wheelchair to her car. However, she has difficulties in folding her wheelchair and she cannot load it behind the driver's seat.

Mobility Aid

SOLUTION: Powered wheelchair loader with folding assist
The loader picked up the wheelchair by an extension under the seat of the wheelchair. This force tended to fold the wheelchair when lifting. The wheelchair could be lifted to a point where the foot rests could be folded without stooping over. At maximum lift, the wheelchair was pushed inside the car using four ball bearing rollers on a lifting track. Power was obtained by use of a powered window motor. (When a person can fold their own chair a hoist can be used, making more room available in back of the front seat.) FFI #4

P-05
Ambulatory
L.E., Impaired
Van Boarding

PROBLEM: Ambulatory passengers need handrail on van lift
Ambulatory passengers in wheelchair user's vans frequently need to enter via the wheelchair lift. This can create a balancing problem for persons who are standing, especially if they have L.E. weakness themselves.

Balancing Aid

SOLUTION: Folding handrail
A suitable folding handrail is available from the R.E.B. Manufacturing Compayn, Route 2, Carey, OH 43316. Cost information may be obtained directly from them. FFI #13

P-06
Obese Wheelchair User
Van Boarding

PROBLEM: Need for extra wide van lift
A wheelchair user who weighs 300 pounds and uses a 36 inch wide wheelchair needed an extra-wide lift for his van.

Mobility Aid

SOLUTION: Lift-Aids
Project IMPART identified Lift-Aids of Texas, P.O. Box 18627, Fort Worth, TX 76118 as a supplier of a suitable device. Obtain cost information directly from supplier. FFI #13

P-07
Paraplegia
Wheelchair Loading

PROBLEM: Unable to load wheelchair into car
A paraplegic driver needed an assistive device for loading the wheelchair into the space behind her car seat.

Lifting Aid

SOLUTION: Simple wheelchair loading mechanism
A small winch was installed on the floor board in the right rear of the car. It was operated by a switch on the dashboard of the car on the driver's side. The cable from the winch was run through a pulley suspended from the ceiling. With only slight guidance the wheelchair could be pulled up over the threshold of this two door car and slid into the space behind the seat. FFI #6

P-08
Multiple Sclerosis
Paraplegia, U.E.
Weakness
Wheelchair Loading

PROBLEM: Transfer balance problem
Driver has difficulty transferring from wheelchair to car and in moving around the steering wheel after he gets in because of weakness and impaired balance.

Mobility Aid

SOLUTION: Specialized equipment
The March 5, 1974 issue of the Los Angeles Examiner reported on a front seat available in SAAB 99 models that can be turned 90 degrees. It also has a special undercarriage that allows the seat to be pushed four inches outside the doorstep. Another solution to this problem is an adjustable steering wheel and electrical powered front seat and use of a stool with two legs outside the car and two legs inside the car on which the driver sits, bridging the gap between the wheelchair and the car seat. The use of this stool aids in loading and unloading the wheelchair in back of the front seat. The adjustable steering wheel allows more room for entry. FFI #4

P-09
SCI
Quadriplegia
Wheelchair Securement

PROBLEM: Wheelchair securement in commercially used van
Worker is transported in a van and driven to and from work. The van is equipped with a lift. The van is also used commercially and no projections should be on the floor. What kind of securement can be used?

Positioning Device

SOLUTION: Design of removable clamps as hold down devices
Two over center clamps were designed. They can be attached to wheelchair and van floor and can be easily removed when not in use. The over center feature assures the proper tension preventing any movement of the wheelchair in any direction. Plans for construction of clamps are available. Safety belts should also be used and attached to van floor. FFI #4

W-01
Multiple Sclerosis
Tremors
Accounting

PROBLEM: Tremors preclude use of standard automatic dialer
C.P.A. needed a way to operate an automatic dialing device, pre-set to dial separately each of his seventeen customers. He has continuous severe tremors so he can not use the closely placed normal buttons on an automatic dialer.

Dexterity Aid

SOLUTION: Rewired automatic dialer
An automatic dialer was rewired to extend each of seventeen button connections to separate push buttons, widely spaced on a long board located on the edge of the desk. FFI #15

W-02
Blindness
Administration

PROBLEM: Need to review tape recorded materials quickly
A totally blind project coordinator for an association of art museums needs to review extensive taped materials in lieu of reading written reports. The additional time required to listen to spoken materials, compared with reading time, reduces the efficiency of her time usage, however.

Sensory Aid

SOLUTION: Speech compressor
Several speech compressors, which permit playback of recorded materials at speeds faster than the original recording without altering the pitch of the voice, are available commercially. For example, combined recorder/compressors are available from Variable Speech Control Co., 185 Berry St., San Francisco, CA 94107, (415) 495-6100, and Visualtek, 1610 26th St., Santa Monica, CA 90404, (213) 829-3453, for around $300. A compressor unit which may be used with other variable speed playback units is available from American Printing House for the Blind, 1839 Frankfort Ave., Louisville, KY 40206, (502) 895-2405, for approx. $85. FFI #2 & #3

W-03
Hand Absence
Assembly

PROBLEM: U.E. amputee unable to do two-handed job
In a sheltered workshop a client with one hand was not able to perform a job which required the assembly of valve handles by inserting a threaded bolt into a drilled and tapped sleeve.

Jig/Fixture

SOLUTION: Holding fixture
A fixture was built to hold the post head by means of a slot milled into the base of the fixture. This prevented the bolt from twisting when the sleeve was screwed on. The completed assembly was dropped down a chute to a tote box. FFI #6

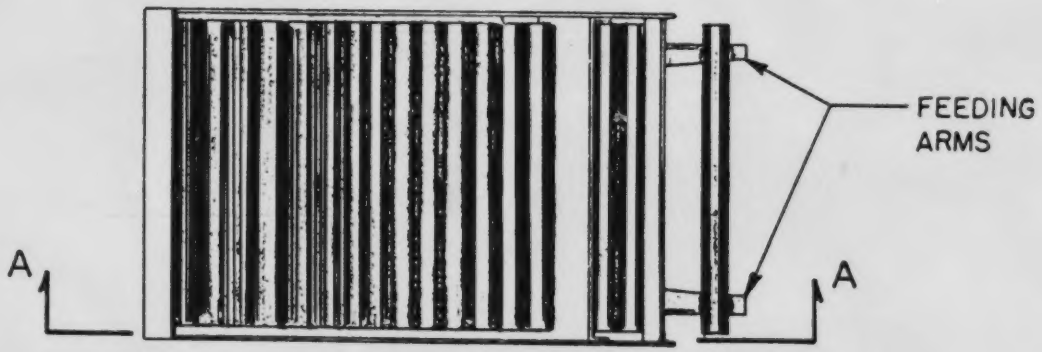
W-04
Any Etiology
Hand/Finger Dexterity, Poor
Assembly

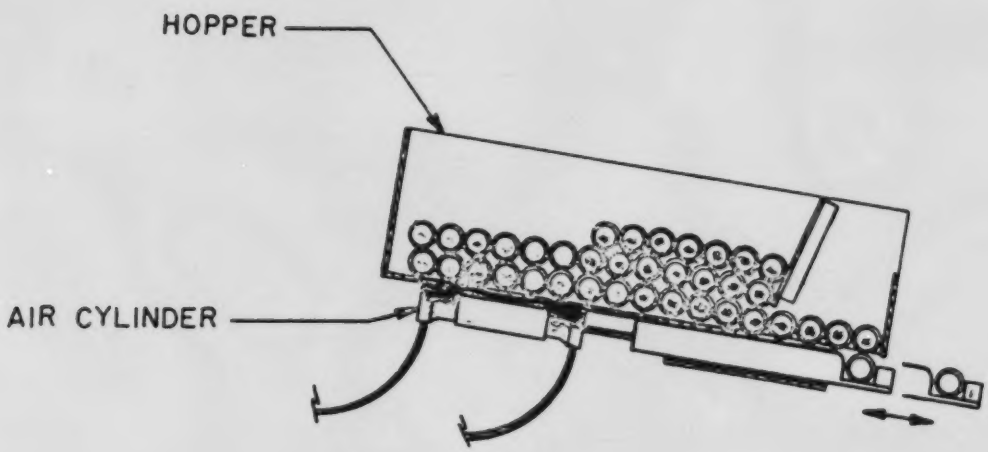
PROBLEM: Lack of dexterity to search, select, grasp objects
Ten inch lengths of steel tubing (.75 or .875 inch diameter) are received by Center Industries Corp. in Wichita, KS in bulk quantities for a manufacturing/assembly job. They are placed in large hoppers containing several hundred tubes. Several disabled workers lacked the dexterity to search, select, and grasp one tube from the hopper.

Jig/Fixture

SOLUTION: Cylindrical parts selector feeder
A tube feeding device was designed that would select one tube at a time from the hopper and place it within easy reach of the operator. The tubes are stacked orderly in the hopper so they roll to the selecting slot. The tube is fed to the operator by two feeding arms, which are parallel and suspend each tube between them in presized

notches. They are powered in and out (select and place) of the hopper by a small air cylinder. The feeding action may be activated by the operator or some other related operation. FFI #1





SECTION A-A

CYLINDRICAL PARTS SELECTOR FEEDER

W-05
Hand/Finger Dexterity
Poor
Assembly

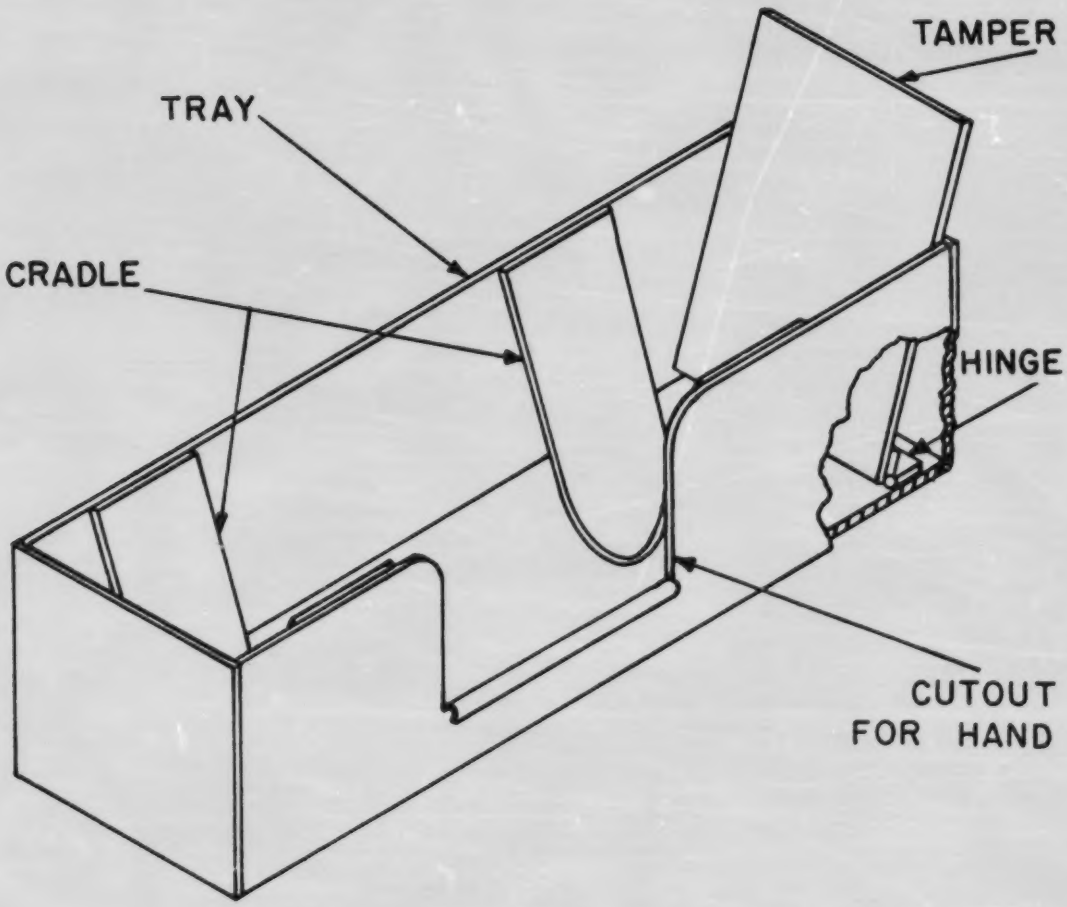
PROBLEM: Impaired grasp and dexterity

A manufacturing operation at Center Industries in Wichita, KS entails removing 13 inch wires from a rectangular tray and bundling them in bundles of 100 units. A worker with poor dexterity in his hands and fingers had difficulty removing them from the tray and was unable to bundle them with a tape wrap.

Jig/Fixture

SOLUTION: Wire bundle tray

A holding tray was designed and fabricated that would accumulate the wires into a bundle that could be easily grasped for taping. It incorporates a radiused holding cradle and is cut-out on one side to accept the operator's hand as he grasps the bundle of wires. The tray is approximately one and one half inches longer than the formed wires to allow placement of a plate which is hinged at the bottom in one end of the tray to act as an alignment tamper. The tamper is mounted in the tray at a slope which provides for a funnel effect to ease placement of the wires in the holding tray. (See illustration.) FFI #1



HOLDING TRAY

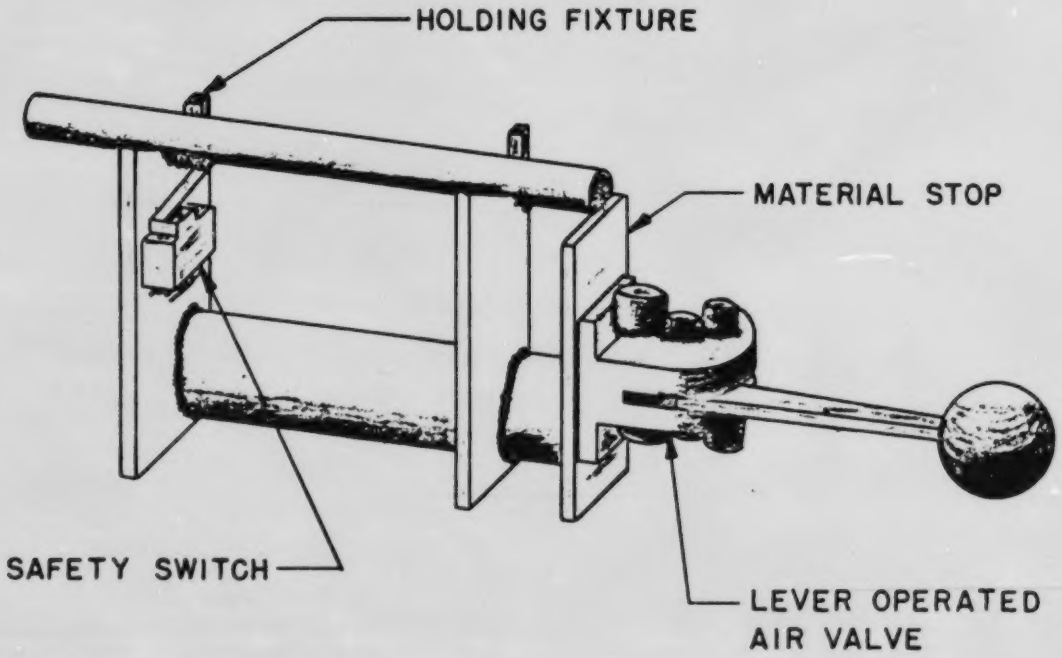
III-39

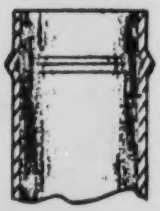
W-06
Paralysis, Judgement Impaired
Beading Machine Operation

PROBLEM: Inability to stand, poor manual dexterity
The beading machine used in a manufacturing process is operated from a standing position and requires the operator to operate two levers, hold a length of steel tubing in place, and gauge the length of cycle time during each beading operation. The employee selected used a wheelchair, did not have the dexterity to operate the levers and hold the tubing, and lacked the judgement necessary to gauge the cycle length consistently.

Jig/Fixture

SOLUTION: Modified tube beading machine
A new machine stand was built to lower the beading machine. The levers were fitted with air cylinders to incorporate pneumatically powered actuation. An electronic timer was built that controlled the length of time the beading head was engaged. A holding fixture was fabricated which eliminated any operator error in aligning the tube with the beading head. This included a material stop for locating the tube, and a safety switch which prevented machine operation until the tube was properly nestled in the cradle. A lever operated air valve was installed to actuate the sequence of operations. FFI #1





CROSS SECTIONAL VIEW OF BEADED TUBE

MODIFIED TUBE BEADING MACHINE

III-40

W-07
Grasp, Impaired
Benchwork

PROBLEM: Unable to remove parts from work area
In a sheltered workshop a handicapped client with limited grasp and reach found it difficult to remove finished parts from his work area and transfer them to a tote bin. Small parts were particularly difficult.

Dexterity Aid

SOLUTION: Drop chute
A drop chute was built into the work bench leading to a tote bin. Thus the grasping operation was eliminated and the required range of motion and reach were significantly reduced. FFI #6

W-08
Grasp Impaired
Benchwork

PROBLEM: Difficulty manipulating small objects
In a sheltered workshop it was necessary to remove about 12,000 screws mistakenly placed in electrical terminal blocks. The terminal blocks were small and difficult to handle for handicapped clients possessing grasping coordination problems.

Jig/Fixture

SOLUTION: A jig for removing screws
A jig was designed to hold the terminal blocks. Holes centered over screws to be removed acted as a guide for a power screwdriver. The jig was fastened to a work bench and located over the hopper of a drop chute to catch screws as they were removed.

Some quads were able to carry out this funtion satisfactorily. Reasonable hand-eye coordination, reasonable grasp, and reasonable hand strength were requirements. FFI #6

W-09
Cerebral Palsy
Grasp, Impaired
Dexterity, Impaired
Benchwork

PROBLEM: Poor grasp dexterity
A trainee with cerebral palsy needed a bench job (sitting) but lacked the grasp dexterity needed to perform at an acceptable rate on packaging tool checks for a production run.

Jig/Fixture

SOLUTION: Grasp pad
A foam rubber grasp pad was placed on the normal assembly surface so parts and tools could be distributed on it prior to assembly. This resulted in a performance increase of 435%. (Continuing studies are examining the effects of pad density, item dimensional characteristics, and physical disabilities.) FFI #1

W-10
Quadriplegia
Benchwork

PROBLEM: Unable to manipulate small objects
In a sheltered workshop a task required hand starting two set screws into a drilled and tapped brass block, driving the set screws to a seat, and backing the set screws out to a predetermined position. The task required a good deal of dexterity and it was desired to restructure the job to enable "gross" motions to be used.

Jig/Fixture

SOLUTION: A jig for driving set screws
A jig was designed to position the brass blocks under a locating plate. The operator drops a screw into a location hold, sets it with a power screwdriver and backs it out to a flush position.

The set up was successful using quadriplegics and in one instance a bilateral upper extremity amputee achieved productivity exceeding 50% of standard. Without the devices he could not have performed at all. FFI #6

W-11
SCI
Quadriplegia
Benchwork

PROBLEM: Unable to deburr drilled holes in brass blocks
In a sheltered workshop it was desired for lower level quads to deburr eight previously drilled holes in a small brass block by holding the block against a countersink bit in a drill press. Lower level quads could not safely and efficiently perform this task.

Jig/Fixture

SOLUTION: Holding fixture
A holding fixture was built to hold seven brass blocks at a time in a proper orientation for deburring. A quick release clamp was devised to allow unloading the fixture into a drop chute after completion of the deburring. The fixture was large enough to be easily stabilized on the drill press table and held with one or both hands out of the way of the bit. FFI #6

W-12
SCI
Paraplegia
Benchwork

PROBLEM: Unable to work standing
A guitar factory worker has a spinal cord injury. He has good use of his arms. He uses a manual wheelchair. The employer is willing to lower one work bench where fret work is installed on guitars. Is this the best solution? All other jobs in the plant are standing tasks.

Work Site Modification

SOLUTION: Elevate client by special wheelchair
The lowering of only one job area would limit the worker to that job. An elevating electric wheelchair was provided which made many standing job sites available to the worker. The electrically powered wheelchair also enabled the worker to carry materials without danger of dropping them. The wheelchair used by this worker was discontinued, however. Orthokinetics, Inc., P.O. Box 2000, Waukeshi, WI, made one model of an elevating wheelchair and is now redesigning it. General Teleoperators, Inc., Box 3584, Los Amigos Station, Downey, CA 90242, will also build a power elevating wheelchair on order. FFI #4

W-13
SCI
Paraparesis
Brazing

PROBLEM: Difficulty in shifting between work areas
A brazing operation required a worker who uses long leg braces and Canadian crutches to move a cooler from a slanting holding rack to a table, turning it over to complete the brazing operation. This required ambulation by crutches and movement of his working stool to a new work area.

Mobility Aid

SOLUTION: Revolving work holder
A television chassis holder was modified to hold the various cooling units. The holder was adjustable and could be revolved to complete the brazing operation without the worker having to change work areas. Quick change clamps were used to fit and hold the parts to be brazed without damage to the parts. FFI #4

W-14
Blindness
Broadcasting

PROBLEM: Inability to visually inspect meters
A totally blind radio operator was able to perform most aspects of his job with the simple addition of Braille labels to tape cartridges and disc recordings. However, determining grid voltage, plate voltage, RT output, and frequency deviation generally require visual inspection of the various meters.

Sensory Aid

SOLUTION: Aud-A-Meter/Aud-A-Level
The individual was able to monitor all meters with the use of two commercially available devices. The Aud-A-Meter permits reading of a variety of DC meters that have moving needle display with external meter movement terminal posts allowing connection of unit.

The Aud-A-Level monitors audio level of monaural and stereo tape recorders during recording or broadcasting and emits a buzzing output when signal is too strong. Both are available from Science for the Blind Products, Box 385, Wayne, PA 19087, (215) 664-9429. Cost of Aud-A-Level is approximately $235. Cost of Aud-A-Meter is approximately $90. (or $215 for model which can be connected to four meters at once.) FFI #2 & #3

W-15
Any Etiology
U.E., Impairment
Calculation

PROBLEM: Unable to operate a hand calculator
The use of small, hand held calculators has become almost a necessity in our society in work, school, and even home management. Individuals with little or no use of their arms and hands are unable to use them as they are, however.

Dexterity Aid

SOLUTION: Scanning calculator
A row column scanner was interfaced with a standard, off the shelf calculator. The calculator's key board code was determined and the scanner was interfaced with the calculating mode. Calculations are performed in the usual way. After the unit is turned on, a reset button is activated to assure that the unit is in the proper mode. The circuit scans through the numerals (0 - 9) and the functions (=, ×, +, −, %, decimal, and clear). The calculator used utilizes algebraic inputs, so the problem is entered exactly as written. The scanning unit is controlled by a single switch, which may be breath, motion, tilt, or foot activated. This gives the operator access to calculator operation by a single mode of activation. FFI #1

W-16
Blindness
Calculation

PROBLEM: Inability to see for pencil figuring
A blind insurance and securities dealer encountered problems with the extensive pencil figuring required.

Sensory Aid

SOLUTION: Keypact by Comptone
This commercially available device was originally designed to increase efficiency for sighted dealers. The complicated procedures usually requiring pencil figuring are performed in minutes with a long distance telephone accessible computer, a tape recorder, and a printed form easily understood by customers. The Keypact is an array of thumb wheel rotary switches enclosed in an attache case, by which users request analyses for transmission to a central computer. The immediate response is verbal, and printed copies can follow by mail. It is available from the Keypact Division of Computone Systems, Inc., 361 E. Paces Ferry Road, Atlanta, GA 30305. Cost is approx. $1575 plus computer time. FFI #2

W-17
Injury
Arm Rotation, Impaired
Carburetor Repair

PROBLEM: Unable to make twisting motion
A carburetor repairman injured his hand in such a way that he can no longer perform the twisting motions required to disassemble a carburetor.

Power Tool

SOLUTION: Electric screwdriver
Because the screws used in these auto parts are very long, an electric screwdriver not only solved the problem for him, it raised his level of production above that of his co-workers (who subsequently also began using them). Available from large hardware firms in major cities, for approximately $45.00. FFI #4

W-18
Paraplegia
Paralysis
Clerical

PROBLEM: Inability to use foot switch
A receptionist at Center Industries in Wichita, KS was unable to use the dictaphone for recording messages because she could not operate the foot switch due to paraplegia. The switch consisted of two micro switches mounted inside a rocker mechanism. When one side of the rocker switch was pushed, the unit went into a play mode. When the other side was pushed, it went into the rewind mode.

Equipment Modification

SOLUTION: Dictaphone switch for use by paraplegics
The function of the rocker switch was duplicated using a push to turn on and a push to turn off switch to control the play mode. A single pole double throw momentary push button switch was used to control the rewind mode. These switches are mounted in a small box. The receptionist can now operate the dictaphone with her hands. The new switch is plugged in parallel with the old switch; thus, when one desires to use the foot operated switch rather than the hand-operated push button switches, one merely unplugs the hand-operated switch and proceeds to control the unit with the foot switch. FFI #1

W-19
MD
U.E. Impairment, Bilateral, Wheelchair Usage
Collections

PROBLEM: Unable to approach desk and use standard telephone
A 21 year old male with muscular dystrophy obtained employment as a collection correspondent with a national chain department store. Because of confinement to an electric wheelchair and bilateral weakness in upper extremities, he had difficulty utilizing a standard telephone to call customers, and was unable to have full access to his desk as his wheelchair was too high to allow the arms to slide under the desk.

Worksite Modifications

SOLUTION: Headset telephone, elevating blocks
Standard telephone headset was provided and desk was raised on blocks to permit access by wheelchair. FFI #6

W-20
Deafness
Computer Operation

PROBLEM: Unable to establish smooth typing rate on computer terminal
A visual feedback method was required to assist deaf data terminal operators in establishing smooth and continuous typing rates.

Sensory Aid

SOLUTION: Metronome with light signal
An electric metronome with convenient setting for tempo and a flashing light to indicate tempo was found to be suitable for the purpose. It is available from J.A. Preston, 71 Fifth Ave., New York, NY 10003. Inquire direct for cost information. FFI #13

W-21
Post Polio
Paralysis
Computer Programming

PROBLEM: Inability to lift objects
A computer programmer, paralyzed by polio has weak arms but strong fingers, and uses an electric powered Lazy Susan desk very effectively. However, because she must sit in a reclining position, it is very difficult for her to hold and read bulky printouts, especially when two must be read and compared simultaneously.

Mobility Aid

SOLUTION: Ramp attachment for electric-powered Lazy Susan desk
On site observation revealed that she had learned to use her mobile desk to do things her weak arms couldn't do, such as assist in lifting printouts. A ramp was designed to assist her when she used the moving desk top, while hanging on to the printouts, to drag them up the ramp to a tilted platform from which it was easier for her to read. FFI #4

W-22
Infectious Polyneuritis
Quadriplegia
Computer Programming

PROBLEM: Totally paralyzed woman wishes to work as computer programmer

A woman who is completely paralyzed from infectious polyneuritis wanted to develop a career as a home-based computer programmer. Her environment needed to be massively instrumented to make this possible.

Mobility/Dexterity Aid

SOLUTION: Home environment instrumentation

NUREP first recommended that the use of an enviromental control system would increase her independence by permitting her to make her own phone calls, and use control lights, radio, and other equipment. The state VR agency funded a Northwestern University Comfort and Communications System. She was also fitted for a mouthstick to assist in typing, using a tape recorder, writing, and turning pages of a book. This has three interchangeable types of tips. Later, she was provided with an E&J model 34, 24 volt electric wheelchair with powered recliner activated by a headswitch mounted directly on the headrest which did not obstruct peripheral vision, sip and puff controller, and a ROHO seat cushion. This gave her more power to negotiate ramps, could be controlled more safely, and allowed independent position changes to relieve pressure and fatigue. Her Hoyer lift sling was coated with latex to reduce slippage while reclining. A mouthstick holder was provided so she could travel safely using the sip and puff controller. Mounted on the armrest post, it allowed her access to the three interchangeable tips without obstructing her functioning. Her work counter is two feet deep forming an "L" of ten feet and four feet. At the corner is a typewriter support frame with adjustable angling table. Also mounted on the counter is a computer terminal support frame with terminal. FFI #9

W-23
Cerebral Palsy
Paralysis, Spastic
Custodial

PROBLEM: Inability to bend/stoop

A client performing custodial work at Center Industries in Wichita, KS was unable to bend over to hold a dust pan and sweep dirt into it.

Mobility Aid

SOLUTION: Floor sweeping collector

A pan was designed which consists of a large rolling dustpan on wheels with a long handle. Both hands can be freed to manipulate the broom and the pan holds large amounts of sweepings before needing to be emptied. The device can be fabricated at little cost with scrap material usually found around production shops. FFI #1

W-24
U.E. Amputee
Unilateral
Deburring

PROBLEM: Unable to hold part for deburring

In a sheltered workshop it was required that a 5/16" hole through the head of a stainless steel bolt be deburred. A holding fixture was needed in order to permit a triplegic client to perform this task.

Jig/Fixture

SOLUTION: Holding fixture

Such a holding fixture was fashioned using a wood fixture and quick acting toggle clamps so that the bolt was positioned in the proper orientation for the drill press deburring operation. The fixture was large enough that the bolt was stabilized on the drill press table and could be gripped or held down by one or both hands without danger to the hands. FFI #6

W-25
Blindness
Broadcasting

PROBLEM: Unable to identify record albums and cuts

A blind disc jockey was referred to IMPART for help in finding a way for him to identify record albums and the individual record selection cuts on LP albums.

Sensory Aids

SOLUTION: Optacon plus paper money identifier

It was found that the Optacon (tactile readout reading system available from Telesensory Systems, Inc., 3408 Hillview Ave., Palo Alto, CA 94304, (415) 493-2626, for approximately $3000) could aid in choosing the correct albums, and that a paper money identifier developed by the Southwest Research Institute (an IMPART collaborator) could be attached to the turntable pickup head to identify individual record selection cuts. The Paper Money Identifier and Audible Light Detector are now available commercially from EMR Ltd., Drawer 845, Pico Rivera, CA 90660, for approximately $130.

FFI #13

W-26
Cerebral Palsy
Quadriplegia, Spastic
Drill Press Operation

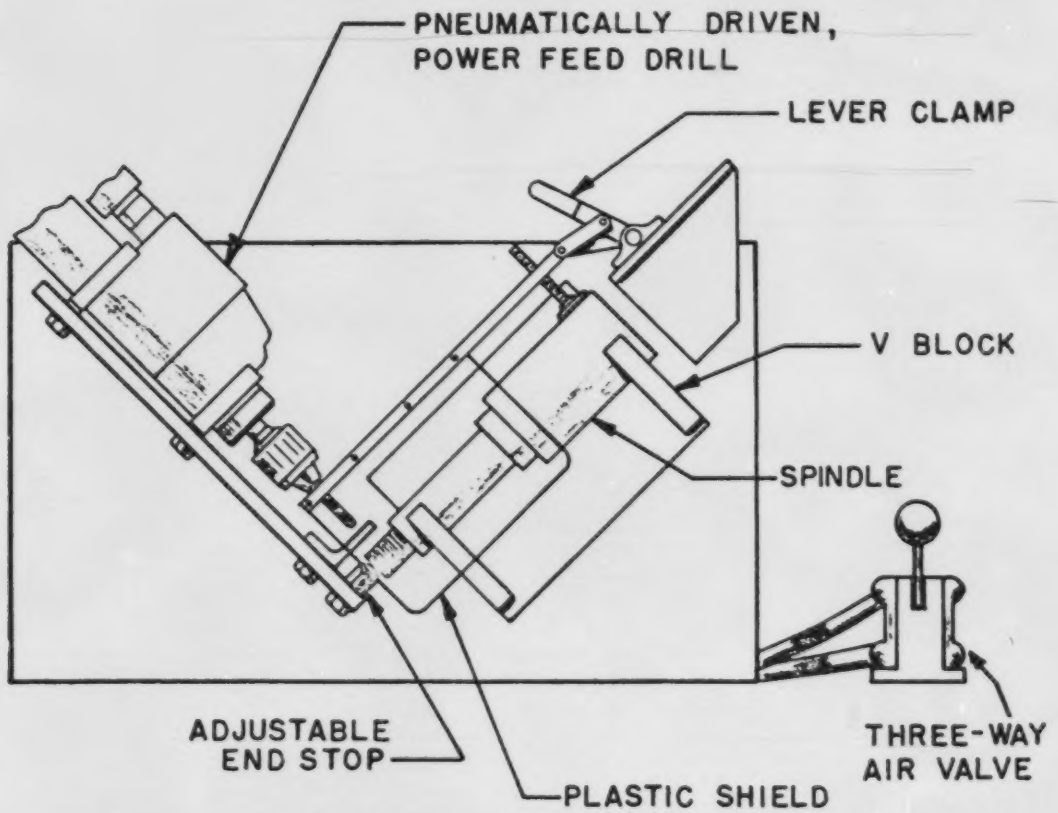
PROBLEM: Inability to operate standard drill press

An employee with spastic quadriplegia was selected to perform a drilling operation in the production of trailer axle spindles. He scored well below the 50 percentile level of the able-bodied standard on the Available Motions Inventory. The right hand had an effective work area only at shoulder height and within 12 inches of the chest. The spindle weight of up to four pounds required the operator to have good lifting strength and stamina.

Jig/Fixture

SOLUTION: Spindle drilling fixture

A drill fixture was designed so the spindle is positioned at a 45 degree angle to the table work surface. The spindle is supported by V blocks and an adjustable end stop. The angled positioning allows the spindle to slide against the adjustable end stop for accurate drill position.



SPINDLE DRILLING FIXTURE

III-46

During the drilling operation, a simple lever clamp holds the spindle securely in the V blocks. The drilling is performed by a pneumatically driven power feed drill. (See illustration) Spindle drilling proceeds as follows: A spindle is placed in the drill fixture; the spindle is automatically located due to gravity, which positions the spindle against the end stop; the lever holding clamp is secured and the drill operation is activated by a three-way air valve; the pneumatically powered drill sequences through the drill and retract operations; the lever clamp is released and the spindle is removed and set aside for inspection. The entire work station was located at shoulder height and as close to the chest as safety would permit. FFI #1

W-27
Syringomyelia
U.E. Paralysis
Driving

PROBLEM: Unable to operate transportation service
A 36 year old male with Syringomyelia of the spinal cord developed a transportation service for wheelchair-bound persons. Because he lacked functional use of upper extremities, he was unable to drive a passenger van, answer telephone calls for services, or assist passengers in transferring into and out of the van.

Foot Controls

SOLUTION: Foot controls, head set telephone, assistant
Van was installed with commercially available foot controls, head set and tape recorder were provided to handle phone calls, and assistant driver was hired to assist passengers in transfers and to drive "extra trips". FFI #6

W-28
Visual Impairment
Electronics

PROBLEM: Inability to read schematics
A worker was able to perform his duties of testing circuit boards, trouble shooting, and repairing poor connections through the use of special lenses attached to his glasses which allow free use of his hands. Reading schematic drawings presented a problem, however.

Sensory Aid

SOLUTION: Closed circuit television (CCTV)
He was able to read the schematic drawings when they were placed under the camera of a closed circuit television system which both enlarges and presents the image in high contrast on a cathode ray tube (CRT) monitor. Available from such vendors as: Pelco Industries, Inc., 351 E. Alondra Blvd., Gardena, CA 90248, (213) 323-1628 (CA residents), (800) 421-1146 (out of state), cost approximately $1600 — $1700; Visualtek, 1610 26th Street, Santa Monica, CA 90404, (213) 829-3453, cost range approximately $1200 — $1950. FFI #2 & #3

W-29
Aphasia Brain Injury
Embossing Metal

PROBLEM: Inability to count/poor spatial judgement
In the manufacture of motor vehicle license plates, the operator must be adept at using hands, have enough stamina for a normal work day, be able to count, and use some judgement in placing the numerals. An employee selected to fill the position met all requirements except for counting and placement of numerals due to aphasia post traumatic brain injury.

Jig/Fixture

SOLUTION: Digital readout numerical counter
Testing showed the employee could match numbers/symbols and follow written instructions so that all that was needed was a digital counter which could sequence the numbers and was also capable of correct columnar placement of the numerals. In the counter and display unit constructed, the counter consists of five digits and is capable of counting any sequence desired between 0 and 99,999. As

the count increases to 2, 3, 4, or 5 digits, the number displayed is positioned left or right to maintain a specified format.

Total of 5 digits	x	x	x	x	x
1 digit			9		
2 digits			9	9	
3		9	9	9	
4		9	9	9	9
5	9	9	9	9	9

The counter may initially be set up by the supervisor to agree with the starting number. It indicates the correct numbers of the snapper dies that should be inserted into the press. To facilitate selection of dies, the number of each is painted on the handle. The operator checks the counter readout and matches the die's number to it. The die is inserted into the press and the press is cycled which embosses the plate. After the press is cycled, at least one digit on the counter will change and the operator changes the die(s) to match the counter number. FFI #1

W-30
Cerebral Palsy
Spastic, Athetoid
Inspection

PROBLEM: Lack of manual skills
When motor vehicle license plates are ejected from the embossing press, they are upside down and reversed. The visual inspector is responsible for removing rejects, and deciding whether to stop the press if inspection indicates serious error in the embossing process. The individual selected for the job was diagnosed as "cerebral palsied, spastic, athetoid" and could neither turn the plates over, reverse them end-to-end, nor remove them from the conveyor inspection line.

Jig/Fixture

SOLUTION: Visual process inspection station
A large mirror was installed above the inspection line opposite from the inspector to effectively reverse the tags for reading. It was canted for easy viewing from a wheelchair. An air jet, under the control of the inspector, is directed across the line perpendicular to the motion of the line. (Because plates are aluminum, a magnetic process was not feasible.) A scrap metal container is located on the opposite side of the line from the air jet to receive rejects. The air jet is controlled by an electrically operated solenoid valve. A 12 volt dry cell holding system connects the appropriate relays to the inspector's control buttons, which are located per his specific requirements. The embossing press lockout scheme uses a relay to interrupt the process. Once the inspector stops the press, it must be re-started by the supervisor. The 12 volt dry cell system is used in conjunction with relays to isolate high voltage from the inspection station. FFI#1

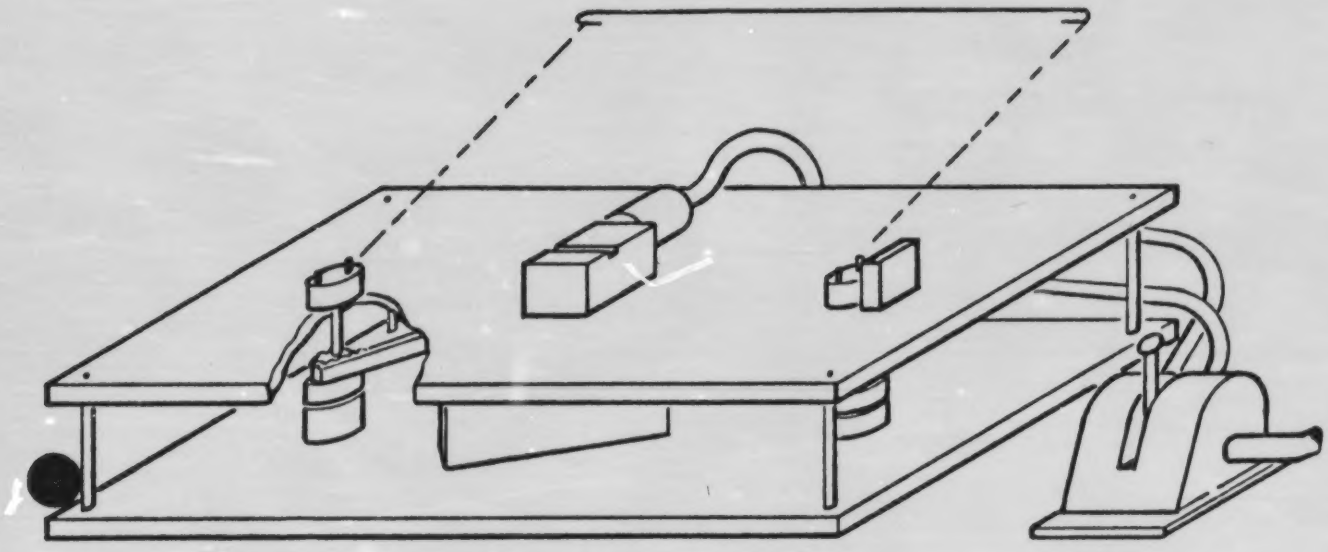
W-31
Any Etiology
U.E. Function, Limited
Installation

PROBLEM: Workers lacking strength and use of both arms
Manufacturers ship **spring struts** (mechanical door openers) to recreational vehicle manufacturers in a compressed condition ready for installation. The retaining wire is typically bent by a two-handed wirebender which requires good eye-hand coordination, good grasp, two-hand coordination, good range of motion, and upper body strength to rotate both levers simultaneously. A small tool used to pry the wire from the bending pins requires fine motor control and good hand strength.

Jig/Fixture

SOLUTION: Pneumatically-powered wirebender
A pneumatically-powered wirebender with pre-set stops and solid pin construction was designed and fabricated which can be used effectively by individuals with very limited use of one arm. Pneumatic cylinders and mechanical drives were mounted

between two ½ inch steel plates to maintain dimensional stability of the wires and to eliminate the possibility of operator contact with pinch points. The cylinders drive lengths of geared rack across pinion gears which turn the bending heads 180 degrees and return to their original positions on the return stroke. The bending head consists of a rotating cylinder with two hardened dowel pins spaced to allow the wire to be easily slipped between them and with bending allowance for the finished wires to be easily removed by hand. A stop is installed to insure proper positioning of the wire and a pneumatic clamp holds the wire in place while it is being formed. The tool is operated by a small four-way hand valve or an electric solenoid valve could be used which would allow for many different means of activation. FFI #1



Pneumatically-Powered Wirebender

W-32
SCI
Quadriplegia
Insurance Examining

PROBLEM: Reliance on co-workers for manipulating work materials
A state employee was referred for evaluation and recommendations regarding more independent functioning on the job. He has a spinal cord injury at the C5, 6 level (incomplete), and he is functionally quadriplegic with fair use of his arms and gross grasping ability with his hands (contracted). An evaluation was conducted at his place of employment to determine what technical aids could help him in his performance as a state insurance department insurance examiner. He uses a powered wheelchair for mobility, relies on others for positioning and manipulating books, papers, forms, etc., and cannot use a telephone efficiently.

Work Site Modification

SOLUTION: Recommended modifications
The following devices were recommended to allow this client to perform certain tasks independently and efficiently: (1) A twin-turntable desk, low height range, executive model with bilateral straight extension desks that should be located facing the wall in his workspace to allow him ready access to files, business equipment, books, etc.; and two deluxe easy file trays for access to client folders. (2) A Saltus reader, which is a motorized scroll, for ready access to regulation sheets, telephone index, and other pages of information as well as an additional scroll cartridge to pre-store additional

information, booklets, etc. The unit should be supplied with soft-touch switches for control. (3) An adapted telephone to allow him to dial and receive calls with greater ease and independence. The unit should have a coupler to accept up to five extensions, and the coupler should allow selection of wanted extensions and have a HOLD feature for each extension. The unit could be controlled by a rocker switch and have a flexible gooseneck for the handset. (Coordination with the telephone company is necessary for the installation of this type of device.) (4) An electric stapler. (5) Book shelves mounted on partitions for books that are not used routinely but should be available. (6) Rotating vertical tiers for the storage of papers, small books, etc., and (7) A replacement powered wheelchair with a joystick control, and an arrangement for him to charge the batteries at work.

FFI #10

W-33
Post-Polio
Paraplegia With
U.E. Weakness
Interviewing

PROBLEM: Need for larger accessible work area

An office worker has limited reaching and lifting ability in both upper extremities due to poliomyelitis. Her arms are supported by devices attached to her powered wheelchair. She needs access to various bulky materials, forms, and reference materials during the day. She tries to effectively use a wheelchair tray but does not have enough room.

Worksite Modification

SOLUTION: Electrically powered revolving desk top

This worker could reach a 12" x 12" area directly in front of her. A "Lazy Susan" desk was built allowing a circular movement of a disk which was supported by a normal appearing desk. A microswitch controlled a reversible drive motor. Two other support wheels provided a level surface. The desk top increased her available space over 1200%, permitting her total independence in her job of interviewer. The circular portion is faced with micarta on both sides to prevent warp. The desk was painted to conform with colors of other nearby office furniture. FFI #4

W-34
Blindness
Lathe Operation

PROBLEM: Inability to see readout dial on engine lathe

A machinist who became totally blind was unable to repair equipment for oil drilling and pumping machinery for a tool company because the job required the use of an engine lathe which is centered by a dial indicator.

Sensory Aid

SOLUTION: Dial indicator with audio readout

The Smith-Kettlewell Institute developed a replacement part with an audio readout which provides information on angular measurement and mechanical or linear displacement to 1/1000 of an inch. It can be removed so sighted operators can also use the lathe. For availability and cost information contact Smith-Kettlewell Institute of Visual Sciences, Rehabilitation Engineering Center, 2232 Webster St., San Francisco, CA 94115, (415) 563-2323, x 2475. FFI #2 & #3

W-35
Dwarfism
Short Stature
Laundry

PROBLEM: Inability to reach

A laundry worker is too short to reach, fill and empty two large washers. The supervisor will not allow any permanent changes in the work area because workers of ordinary height also feed the machines on other shifts. Stretching overhead proved to be too difficult for him to sustain.

Positioning Aid

SOLUTION: Spring-loaded platform
A spring-loaded platform was designed for his exclusive use. When no downward pressure is on the platform it is easily moved from its storage area near the washing machine. When pressure downward is applied, the platform will not move. The added height makes it easier for the worker to perform. FFI #4

W-36
Stature Short
Laundry Loading

PROBLEM: Unable to reach large washers in laundry
A 32 year old mentally retarded man with mild cerebral palsy is employed as a laundry worker in a large hospital. When he was referred, he was able to perform all duties of his position except loading and unloading the large washing machines because of his short stature.

Worksite Modification

SOLUTION: Spring loaded step
Because hospital safety regulations prohibited the use of a conventional step stool or ladder, a spring loaded step, running the length of the bank of washers, and which lifts up and out of the way when not in use was designed, fabricated, and installed. FFI #14

W-37
Blindness
Lawnmower Repair

PROBLEM: Unable to discern when spark plug has made successful contact
A blind lawnmower repairman needed an audible signaling device to alert him to the spark plug making successful contact.

Sensory Aid

SOLUTION: Radio/amplifier
A simple method which eliminates the dangers inherent in other methods is to place a transistor radio or audio amplifier nearby. The whine of the spark will create static on the radio or amplifier. FFI #13

W-38
Post-Polio
Quadriplegia
Lens Grinding

PROBLEM: Slowness in operating hand-operated lens grinding machine
A 24 year old male polio quadriplegic obtained employment as a contact lens curve grinder with a contact lens manufacturing company. Because of bilateral paralysis and weakness in upper extremities, he was very slow in operating a hand operated grinding machine.

Automation

SOLUTION: Pneumatic lens grinding machine
A commercially available pneumatic grinding machine was purchased which resulted in improved efficiency in client's performance. FFI #6

W-39
Quadriplegia
Machine Operation

PROBLEM: Unable to operate control knob
In a sheltered workshop, a quadriplegic and others with grasping and twisting inadequacies found it was impossible to operate a Recordak Microthin Jacket Reader-Filler. The clients could not manipulate the machine's operating knob which drives the film into the proper jacket channel and positions the film precisely at the cutting knife.

Jig/Fixture

SOLUTION: Grasp rods
Four 1/8" holes were bored in the face of the operating knob at 90 degree intervals. Lucite rods were glued in the holes with one inch of rod protruding parallel to the axis of the knob. The grasping and twisting motion formerly required were eliminated. FFI #6

W-40
Blindness
Machining

PROBLEM: Inability to see readout dial
A machinist who lost his sight returned to work for an airline, using a variety of specially adapted Braille micrometers, taped instruction manuals, and Braille-labelled parts bins. A means was also needed for him to check for gas leaks after a repair which did not require visual inspection of a needle pointer on a pressure gauge.

Sensory Aid

SOLUTION: Electronic pressure gauge with auditory signal
This 5x7x3 inch gauge produces an auditory signal as long as the pointer is NOT on the correct value of pressure; when the pointer is adjusted to the correct pressure setting, the tone disappears. A hose connects it to the refrigeration system. On top is a crank knob with Braille markings surrounding the pointer. Documentation sufficient to reproduce the unit is available from Smith-Kettlewell Institute of Visual Sciences, Rehabilitation Engineering Center, 2232 Webster St., San Francisco, CA 94115, (415) 563-2323. Contact Bill Gerrey, x 2475, for details and costs. FFI #2 & #3

W-41
Quadriplegia
Micrography

PROBLEM: Unable to grasp paper sheets
In a sheltered workshop a quadriplegic with grasping and reach problems found it impossible to feed sheets from a stack into a rotary camera for micrographic work at a reasonable speed.

Dexterity Aid

SOLUTION: Feed tray
A staff orthotist designed a feed tray manually operated which permitted the grasp-limited client to place a stack of sheets to be fed to the camera into the tray and feed them into the camera with a relatively simple short hand stroke which involved no grasping. The bottom of the feed tray was curved so that the stack of sheets was easily riffled and edge guides kept the stock oriented. FFI #6

W-42
Quadriplegia
Micrography

PROBLEM: Unable to grasp control knob
In a sheltered workshop, a quadriplegic with grasping problems could not operate a Micrographics Editor because he could not grasp and turn the control knob to each of the five positions which controlled the operation of the machine.

Dexterity Aid

SOLUTION: Lever control
The control knob was held in place by two set screws. One of these was removed and in its place a two-inch threaded lever was inserted. The grasping problem was eliminated. FFI #6

W-43
Post-Polio
Quadriplegia
Office Work

PROBLEM: Unable to access materials in office work job
A 27 year old woman with a diagnosis of post-polio quadriplegia needed to increase her independence in her office. Due to her limited reach, it was difficult to access various materials and to operate the telephone and tape recorder. The upper extremity movements of elbow flexion and use of her fingers were motions which could be utilized to interface with equipment.

Worksite Modification

SOLUTION: Worksite modifications
A rotary desk was designed and fabricated to provide easy access to materials over a large surface. For pressing the extension and hold buttons on the telephone, a base with a sliding lever was fabricated to give increased leverage for depressing the buttons. For dialing, her telephone was modified with string and finger ring that turns the dial as the client uses her elbow flexion to pull the string toward her. Using varying degrees of elbow flexion, the finger ring and string are pulled

to select numbers. For independence in tape recorder operation, a tape recorder was recommended that required only one button to be depressed at a time for operation. A base was made that has a sliding lever which depresses the control buttons when the end of the lever is elevated by elbow flexion. FFI #14

W-44
Developmentally Disabled
Cannot Count
Packaging

PROBLEM: Worker cannot count
A developmentally disabled person, who works in a workshop, cannot count and has to package twelve parts in a plastic bag.

Counting Aid

SOLUTION: Space filling system attached to packing tray
An empty egg carton is attached to a tray that is shaped at one end to hold plastic bag. Items to be packaged are put in pockets of egg carton until each space is filled. The carton is then tipped over into tray. A bag is placed over end and all parts slip into bag when tray is tilted. No counting is required. FFI #4

W-45
Cerebral Palsy
Athetoid Movement
Packaging

PROBLEM: Unable to control arm movements on packaging job
A workshop employee with cerebral palsy was assigned to a packaging job. It required her to package five items in a bag. However, her random arm movements made this virtually impossible using the setup provided for workers with better U.E. function.

Jig/Fixture

SOLUTION: Packing tray with U.E. guides
A tray was designed with compartments for each of five different items to be packaged. The dividing barriers point to the exit hole and serve as a guide for her hands, enabling her to pack the items in a bag which hangs from the "spout" of the tray by a clamp which she can operate to place bags independently. FFI #4

W-46
Dexterity Impaired
Reach, Impaired
Packaging

PROBLEM: Unable to grasp bulky parts
In a sheltered workshop a large volume of bulky parts were to be packaged with each package containing as many as six each of up to six different parts. High hand dexterity and good reach were lacking in the population of amputees, low-lesion quads, and hemiplegics. A packaging station was needed which made these requirements unnecessary.

Jig/Fixture

SOLUTION: Gravity feed bins
A system of gravity feed bins was assembled to deliver the parts into a reasonable reach area, a smooth area, in front of the worker. A loading chute for the package and a delivery chute for carrying the full, stapled package to the shipper are incorporated. High hand dexterity was no longer needed to attain reasonable speed. FFI #6

W-47
Blindness
Photography

PROBLEM: Inability to see liquid levels in containers
A blind darkroom technician must be able to determine when the supply of developing chemicals is low enough to require making a new batch.

Sensory Aid

SOLUTION: Light sensor, Brailled tape levels
A set of Brailed dymo tape labels indicating liquid levels have been placed on the outside of the transparent plastic containers. A light is suspended behind and above them. The technician moves a light sensor down the sides of the containers until a change in emitted pitch

indicates he has reached the surface of the liquid. Available from American Printing House for the Blind, P.O. Box 6085, Louisville, KY 40206, (502) 895-2405. Cost approximately $21.00. FFI #2 & #3

W-48
Low Vision
Focal Length Short
Posting and Calculating

PROBLEM: Neck positional problem
Due to very short focal length of vision, worker bent over his desk causing neck strain with pain.

Positioning Aid

SOLUTION: Vertical desk
A desk nearly vertical instead of flat was designed. This permitted the close vision the worker required for visual acuity, and permitted a more normal positioning of the neck, thereby removing the neck strain and resultant pain. Production also increased with use of the "Vertical" desk. FFI #4

W-49
MD
Arm, Weakness
Precision Assembly

PROBLEM: Precision assembly on new assignment
Worker has weak arms due to muscular dystrophy. He was doing well on an assembly job, but the contract ran out. His new assignment required him to fit two small metal caps by regular hand pressure on the ends of swimming pool thermometers. He is unable to exert the required pressure. Tapping or hammering will damage the instruments.

Jig/Fixture

SOLUTION: Jig to increase leverage and control
An inexpensive hand press and holding jig was designed for this worker. The thermometer and caps were positioned in the press with the thermocouple tube extending through a slotted cutout in the fixed end of the press. A light uniform pressure on the press handle forced both end caps on the thermometer body at the same time. Mechanical advantage was built in to compensate for weak arms. FFI #4

W-50
Blindness
Proofreading

PROBLEM: Inability to see for proofreading
The International Division of Wells Fargo Bank wanted to hire a blind woman as a word processing operator because of her ability to speak Spanish, French, and German. However, proofreading one's own work is an essential part of this job.

Sensory Aid

SOLUTION: Optacon
This commercially available device is a general purpose reading system which produces direct tactile reproduction of printed material. It is available from Telesensory Systems, Inc., 3408 Hillview Ave., Palo Alto, CA 94304, (415) 493-2626. The base price is approximately $3000. FFI #2 & #3

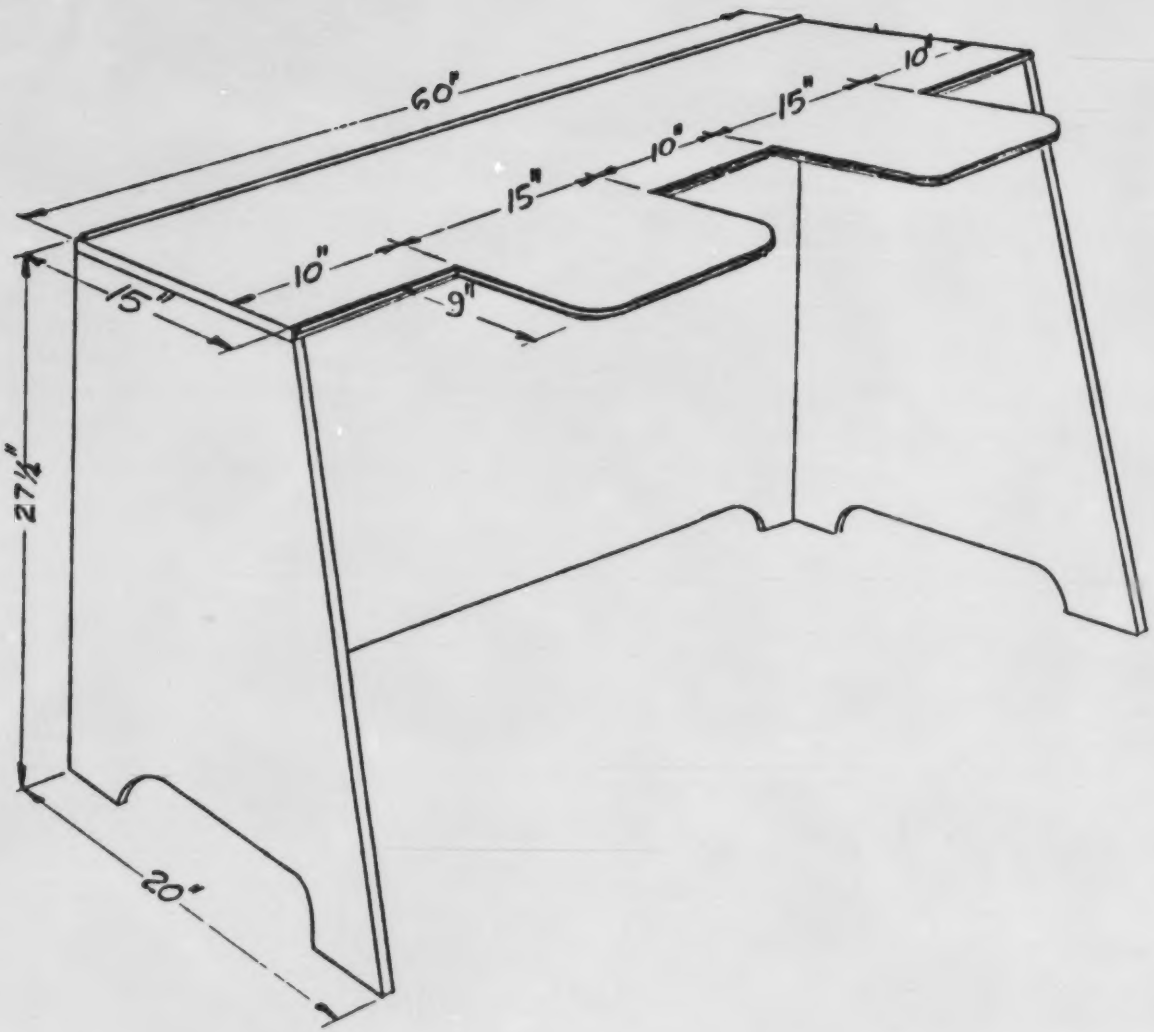
W-51
Cerebral Palsy
Athetoid
Proofreading

PROBLEM: Unable to approach typewriter
A proofreader with cerebral palsy who must type rather than write uses a wheelchair with regular (not desk) arms for safety. Presence of the wheelchair arms demanded a high table which placed the typewriter in an inconvenient position resulting in very poor typing performance.

Worksite Modification

SOLUTION: Special typewriter table
Evaluators at the Southwest Research Institute (IMPART collaborator) found that her best typing speed and accuracy were achieved when the typewriter was essentially in her lap. A special table was designed to place the typewriter in this optimum position. It is low, narrow, and

includes two projections, each of which can wedge between the arms of her electric wheelchair to assure a firm and fixed position. The typewriter placed on such a table is thus in her lap where she has the best control of her arms and hands. It is made of ¼ inch plywood with a rubberized moulding about ½ inch square around the front edge to assure a good fit between projection and chair and to minimize damage due to impact. Three-Quarter inch "quarter round" was installed at the back to keep articles from falling off. FFI #13



SPECIAL TYPEWRITER TABLE

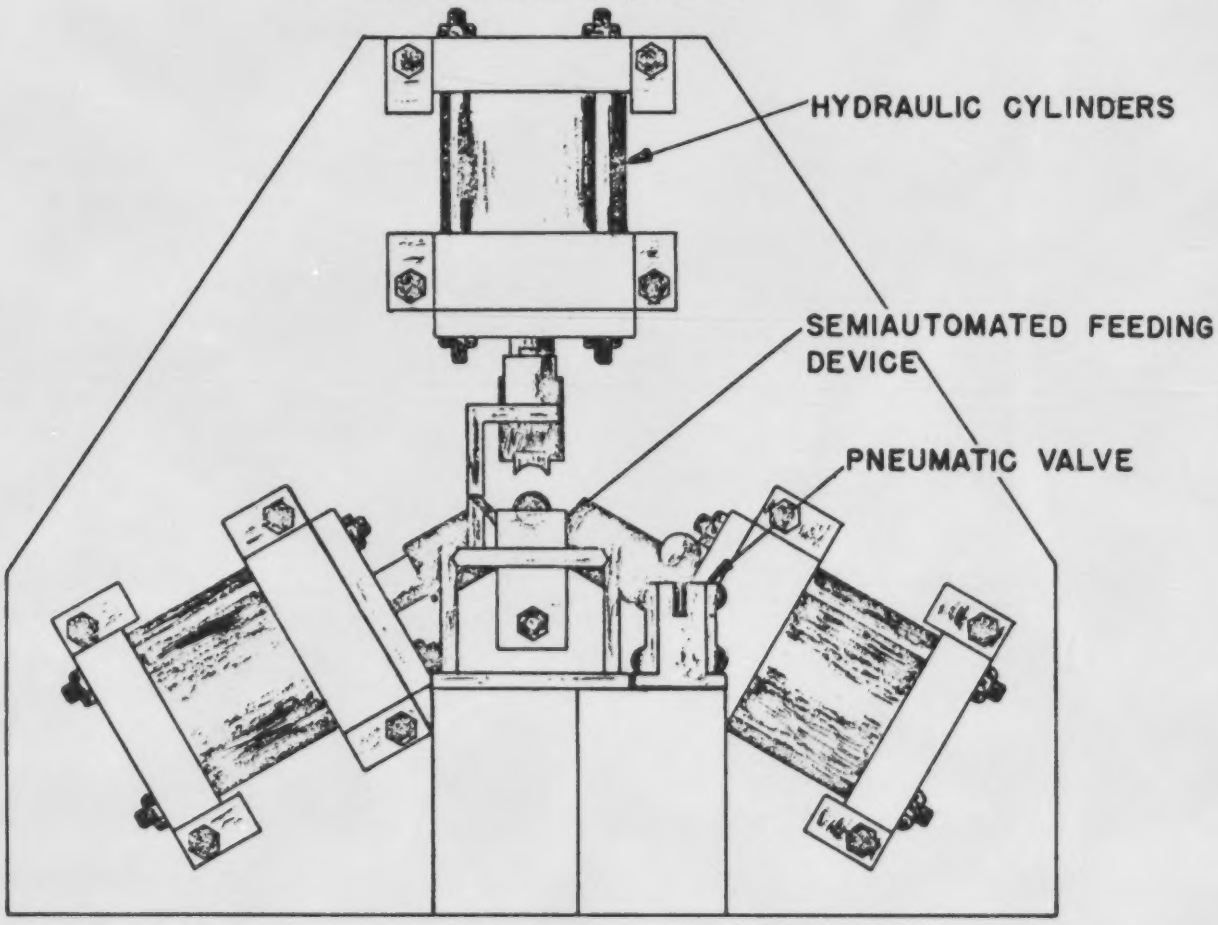
III-55

W-52
Cerebral Palsy
Paralysis, Spastic
Punch Press Operation

PROBLEM: Severely impaired strength and two-handed coordination
A product manufactured requireds a thin-walled steel tube to be crimped at one end. The crimp was formed on a small **punch press** with a single action die, requiring the operator to place the tube on a **forming mandrel**, activate the press, and pull the tube off the mandrel three consecutive times to complete each tube. It was necessary to rotate the tube 120 degrees after each stroke. This required an operator with good two-hand coordination and substantial strength in the hands and arms. The person selected to perform the job had limited use and strength in only one hand. Optimum performance was from a semi-reclined position with operations placed to the side and above shoulder height.

Machine Modification

SOLUTION: Three axis crimper
A new machine tool was designed using three hydraulic cylinders with male form dies. The cylinders were mounted on a plane surface, positioned radially about the forming mandrel, and spaced at 120 degree intervals. (See illustration.) A semi-automated feeding device was included that could position the tube over the forming mandrel and remove it after forming. The operator places the tube in the cradle of the feeding device, activates a pneumatic valve, and removes the tube after forming. Pneumatic valve activation begins the process with the electronic machine logic sequencing the feeding, forming, and retraction operations. FFI #1



THREE AXIS CRIMPER

III-56

W-53
Post-Polio
Paraplegia, Short Arms
Reaching

PROBLEM: Wheelchair user cannot reach P.B.X. console
A post-polio paraplegic with very short arms could not reach the P.B.X. console needed in her work. The console was fastened near the center of a long table. The supervisor did not want to move the console which was properly placed for other workers.

Worksite Modification

SOLUTION: Design cutout which can be closed for other workers
The cutout permitted a close approach to the console. A sliding cover was designed and installed so that other workers could also utilize the work area. FFI #4

W-54
Traumatic Injury
Amputation, Triple
Reaching Top Shelves

PROBLEM: Reaching top shelves to obtain parts
A worker is a triple amputee. He has normal left arm and hand. He has to reach cardboard boxes on a high shelf, take them down, extract parts and return the boxes to top shelf. He uses a manual wheelchair. His right arm prosthesis is used only to help propel wheelchair.

Mobility Aid

SOLUTION: Custom designed reacher
A spring-loaded clamping reacher was designed. When pressure was applied, the reacher opened up. Applied to the box, the reacher handle could then be allowed to slide down in one hand without dropping the boxes. It held the box while parts were removed, and the box was then replaced on the shelf. FFI #4

W-55
Diabetic Retinopathy
Low Vision
Reading

PROBLEM: Must avoid certain head movements
A client with diabetic retinopathy must avoid angling his head down and moving his head from side to side. The client needed a reading stand with a platform to hold reading material. The platform had to move smoothly both vertically and horizontally. The tilt angle had to be adjustable.

Positioning Aid

SOLUTION: Reading stand with three dimensional movement
A reading stand with three dimensional movement was identified. It is available from Martin's Cabinet and Specialty Shop, 1001 W. 2nd St., Taylor, TX 76574, (512) 352-6875. The cost is approximately $25 when ordered in quantity. Inquire direct for individual unit pricing. FFI #13

W-56
Dystonia Musculorum
Movement, Involuntary
Reading

PROBLEM: Unable to hold book open
A man who has dystonia musculorum, which entails uncontrollable motions, jerking, and posturing, works on a volunteer basis as editor of a newsletter for the nursing home in which he lives. He used a number of assistive devices successfully, but a remaining problem involved page turning and holding.

Positioning Aid

SOLUTION: Elastic book strap
An elastic strap with a section of clear plastic which passed over the printed matter, allowing unobstructed vision, proved to be the solution. The elastic can be made tight enough to hold the book open, but not so tight as to interfere unduly with turning the pages of the book. It stays in place firmly enough to withstand his involuntary motions. FFI #9

W-57
Birth Defect
Mobility Impaired
Receptionist

PROBLEM: Unable to depress "hold" button on telephone
Multi-line telephone operation is a major part of a receptionist's job. An employee who had a birth defect and very little mobility was able to cope physically with all phone line buttons except "hold."

Dexterity Aid

SOLUTION: Extension lever
An extension lever of metal was fashioned and installed to give easy access by mouth stick and to dramatically reduce the pressure necessary to operate the "hold" button. FFI #15

W-58
SCI
Quadriplegia
Removing Staples

PROBLEM: Unable to remove staples
In a sheltered workshop, quadriplegic workers could not operate a standard staple remover in a micrographics shop requiring large numbers of staples to be removed.

Tool Modification

SOLUTION: Solenoid activated staple remover
A solenoid activated staple remover was designed and built. FFI #6

W-59
Blindness, Legal
Research

PROBLEM: Viewing material at a distance
A worker with partial vision (no vision in left eye, 20/800 in right eye, and almost a normal visual field in right eye) needed to: (1) View a chalkboard and take notes on or copy what was being written on the board; (2) View maps, charts, and other material spread out on a table which those materials were being discussed and viewed by him and his fully sighted colleagues.

Sensory Aid

SOLUTION: Binoculars
The worker used a pair of 10 x 40 binoculars with one of the binoculars' optical trains capped by a lens which permitted him to see at very large distances, and the other permitted him to see clearly at distances ranging from about 25 to 50 cm.

Binoculars can be obtained from various quality optical and camera shops. However, it is advisable that a partially sighted person have a good low vision examination prior to the purchase of this or other visual aids. Sometimes such an examination will reveal that there is a simpler technique for coping with the problem under discussion as well as with other visual problems or tasks.

A very good discussion of binoculars and their value to partially sighted persons can be found in "Binoculars — A Long Ignored Aid for the Partially Sighted" Rand Report 1402 by S.M. Genesky. This report can be obtained from the Publication Department, The Rand Corporation, 1700 Main Street, Santa Monica, CA 90406. FFI #5

W-60
Blindness
Reservations

PROBLEM: Inability to track lines of characters
A totally blind airline reservationist was able to perform most of her duties easily with the help of various sensory aids, including an Optacon with a CRT lens attachment. However, tracking rows and columns of figures and other characters, without losing her place, proved difficult and time-consuming.

Sensory Aid

SOLUTION: CRT tracking guide
A prototype was successfully tested by her with the airline's cooperation. The guide holds the Optacon CRT lens attachment against a vertical display screen and allows the user to follow the lines without constantly repositioning the camera. Availability and cost information can be obtained from Clement Laboratories, 2560 Wyandotte St., Mountain View, CA 94040, (415) 964-0921. FFI #2

W-61
Blindness
Sales

PROBLEM: Inability to use standard calculator for pricing
A blind office products sales trainee was able to perform all needed functions using standard office equipment plus Brailled materials and a light probe for telephone answering. The calculations required for pricing presented a problem, however.

Sensory Aid

SOLUTION: Talking calculator
The Speech Plus calculator provides a voice readout from all functions of a general electronic calculator. It is available from Telesensory Systems, Inc., 3408 Hillview, Palo Alto, CA 94304, (415) 493-2626. Cost is approximately $400. FFI #2 & #3

W-62
Blindness
Saw Sharpening

PROBLEM: Blind worker needs three hands
A blind saw filer must use his hands for functions ordinarily accomplished by visual inspection. Thus, he needs to move the saw blade which is being sharpened by some other means.

Jig/Fixture

SOLUTION: Knee operated saw indexer
This modification permitted the blind operator to use his hands for alignment and to index the saw (move it forward by two notches) with his knee, without moving his hands from the critical alignment area. FFI #4

W-63
SCI
Paraplegia
Sewing

PROBLEM: Unable to operate sewing machine foot controls
Worker is a spinal cord injury paraplegic. She was a power sewing machine operator prior to her injury. Now she cannot handle the foot controls on her power sewing machine.

Jig/Fixture

SOLUTION: Arm controls for power sewing machine
Extensions were added to the foot controls of the power sewing machine. Alternate controls were set up for use of either arm. The system was designed for easy removal in the event she wanted to change machines or jobs. FFI #4

W-64
Dwarfism
Legs Short
Sewing

PROBLEM: Worker unable to reach power sewing machine controls
A woman who is a dwarf with very short legs wanted training as a power sewing machine operator but she could not reach the foot controls.

Jig/Fixture

SOLUTION: Extensions to foot pedals
Extension controls were attached to the power sewing machine at the training school. They were designed to allow removal and installation on standard power machines used by industry. At the end of the training program, they were installed on the employer's machine. FFI #4

W-65
Post-Polio
Paralysis
Skip Tracing

PROBLEM: Unable to hold large directories
A skip tracer who is a post-polio quadriplegic was able to perfrom most aspects of his job using **Handi-Hooks** (a product of **Robin Aids,** Vallejo, CA, which uses the principle of arm prosthesis to open hook by shrug of opposite shoulder) in both hands. Accessing 50 large, street to street telephone directories was still a problem for him, however.

Holding Aid

SOLUTION: Lazy Susan directory holder
A Lazy Susan directory holder was designed. The directories were attached to the holder by a wire pin which allowed replacement of new issues. The holders were tilted away from the worker. The unit revolves, making each directory available. The worker was then able to use his Handi-Hooks to look up numbers efficiently FFI #4

W-66
Spinal Injury
U.E. Weakness
Small Engine Repair

PROBLEM: Unable to use rope start on small engine
A VR client with a spinal injury and limited use of his arms needed a device or method by which to turn or whirl a small engine instead of pulling a rope to start the engine.

Machine Modification

SOLUTION: Screw-type starter
IMPART located a suitable device, a screw-type starter for small engines that could be used as a starter for lawnmowers, available from Harold Lehnick Co., Route 2, Box 64E, Manor, TX 78653. The cost is approximately $26. FFI #13

W-67
Quadriplegia
Soldering

PROBLEM: Unable to operate soldering tool
In a sheltered workshop, a quadriplegic worker with less than normal strength and dexterity was not able to satisfactorily hold and solder terminal strips.

Jig/Fixture

SOLUTION: Holding device
A bracket holding eight strips in position was fabricated to relieve him of the strength requirement when he soldered. FFI #6

W-68
Low Back Injury
Back Pain
Sorting and Filing

PROBLEM: Difficulty in stooping and bending
Sorting of 8½" x 11" files was performed at the side of a cart which had five shelves parallel to the floor. This required stooping and maintaining a bent over position which placed a strain on a worker with a low back injury.

Worksite Modification

SOLUTION: Sorting shelf and back support chair
The worker had a small desk area and a three-level shelf was designed in an "L" shape to provide enough room for temporary storage while the sorting operation was performed. The worker was also provided with a chair that gave support to the low back area. FFI #4

W-69
SCI
Quadriplegia
Starting Screws

PROBLEM: Unable to start screws
In a sheltered workshop, quads were not able to start screws into tapped holes in brass plugs.

Jig/Fixture

SOLUTION: Holding/alignment fixture
A fixture was designed and constructed to hold a number of parts and to drop screws into slots properly aligned so that with a screwdriver the screws could be started and tightened. FFI #6

W-70
Blindness, Legal
Systems Analysis

PROBLEM: Need for portable CCTV
A legally blind systems analyst working for a bank found that his advancement opportunities were blocked by the lack of a closed circuit TV (CCTV) system which could be easily carried on and off an airplane.

Sensory Aid

SOLUTION: Visualtek Commuter
This commercially available portable CCTV system is available from Visualtek, 1610 26th St., Santa Monica, CA 90404, (213) 829-3453. Cost approximately $900 — $1000. FFI #2 & #3

W-71
SCI
Paralysis
Tape Recording

PROBLEM: Unable to operate standard tape recorder
A high quadriplegic needed to be able to operate a tape recorder for training and work activities, but lacked the necessary finger function.

Dexterity Aid

SOLUTION: Tape recorder for the spinal cord injured
The controls of a reel-to-reel magnetic tape recorder/player were redesigned to provide remote control of the record, playback, rewind, and stop modes. Remote control can be accomplished by either a low force actuated pushbutton unit or a light beam interruption unit. Either unit can be activated by a mouthstick. FFI #6

W-72
Blindness
Telephone Answering
Multiple Line

PROBLEM: Unable to identify correct incoming call line
Blind persons have difficulty promptly answering correct lines on multiple line telephones. Employee needs to quickly identify conditions of four incoming phone lines in use, ringing, on hold, or available for use. Volume of calls is low but important.

Sensory Aid

SOLUTION: Light probe with audio response
A light probe with audio response was found to be the most practical solution. Several probes are marketed commercially but on the West Coast, one is offered by the Pioneers of America, Chapter #31, 421 S.W. Oak Street, Portland, OR 97204, and is very popular. The cost ranges from $19.00 to $25.00. FFI #15

W-73
Cerebral Palsy
U.E. Weakness
Spasticity
Telephone Operator

PROBLEM: Unable to use standard telephone, reach switchboard
A 26 year old female with cerebral palsy obtained employment as a telephone operator in a sheltered workshop. Because of confinement to an electric wheelchair and bilateral weakness and spasticity of upper extremities, she was unable to utilize a standard telephone and had difficulty reaching the switchboard above her desk.

Worksite Modification

SOLUTION: Headset and repositioned switchboard keys
Standard telephone headset was provided and switchboard keys were positioned at front edge of desk. FFI #6

W-74
Post-Polio
Quadriplegia
Telephoning

PROBLEM: Speaker telephone echo
A post-polio quadriplegic working in a desk job must use a speaker telephone because of severe upper extremity paralysis. He complains of echos that make his voice sound like he is talking from a cavern.

Sound Absorber

SOLUTION: Enclosed sound absorbing booth
A non-echo sound absorbing material was built around the desk on which the speaker telephone was installed. This muted the echos and good communication was established. FFI #4

W-75
Hemophilia
Joint Damage
T.V. Repair

PROBLEM: Lifting heavy T.V. chassis for repairs
A worker was trained as a T.V. repairman. He has hemophilia that has damaged his hip and knee joints making it necessary for him to use crutches in ambulation. The pickup man deposits sets for repair on the floor of the shop. The worker cannot lift them up to bench height.

Worksite Modification

SOLUTION: Variable height work bench
An elevating work bench was designed. The work surface of the bench could be electrically lowered to the floor. Sets could be slid onto bench surface. A set could then be raised to optimum level for the work to be done. In case of power failure, the work surface could not drop. Casters allowed the work bench to be used to transport sets from one location to another. Plugs were installed for soldering and testing devices. (When worker was absent, other people [employees] used desk because of its vertical versatility.) FFI #4

W-76
Quadriplegia
Typing

PROBLEM: Mouthstick typists unable to advance/reverse paper
Even with self-correcting typewriters, mouthstick typists still need the ability to advance and reverse the paper through the typewriter roller.

Dexterity Aid

SOLUTION: Electric reverse indexer
A simple, inespensive adaptation to provide electric reverse indexing for an IBM self-correcting Selectric typewriter was developed. It uses a gear motor operated by two momentary contact switches mounted on the typewriter cover. The rear of the typewriter is elevated to allow easy character viewing by a typist who cannot lean forward. Fabrication cost approximately $80.00 Through further development, the Royal 5000C self-correcting electric typewriter, adapted to include these features, is now commercially available for approximately $750. FFI #11

W-77
Amputation, Right Upper Extremity
Typing

PROBLEM: Selection of equipment for typing
A teacher in a training school recommends that client learn to type on one-hand keyboard instead of a regular keyboard. A left-hand keyboard typewriter is available, but no training manual.

Dexterity Aid

SOLUTION: Purchase of keyboard typewriter manual
If the client learns to use the regular keyboard, she will have to do about 40% of the typing work with her little finger. The left hand keyboard distributes the typing load on the best functioning fingers. It also cuts down on the single finger letter sequences which slow down typing. Write to the Typewriting Institute for the Handicapped, 3109 W. Augusta Avenue, Phoenix, AZ 85021, and request a free training manual. Your client can learn to type by using this manual, even without a teacher. FFI #4

W-78
Amputation, U.E., Unilateral
Typing

PROBLEM: Need to type one-handed
An upper extremity amputee needed a typewriter with keyboard arranged for efficient typing with one hand.

Machine Modification

SOLUTION: One-hand typewriter
IMPART found that suitable one-hand typewriters are available from the Typewriting Institute for the Handicapped, 3102 W. Augusta Ave., Phoenix, AZ 85021, (602) 939-5344. The cost for either a right or left hand model is approximately $400. FFI #13

W-79
Cerebral Palsy
U.E., No Function
Typing

PROBLEM: Inserting typing paper for head stylus typist
An employee who lacked U.E. function learned to type accurately on an IBM Selectric (whose built in features greatly enhance typing capabilities) using a head stylus, but had to ask for help each time a paper change was required. Typed rough drafts only.

Mobility Aid

SOLUTION: Typewriter paper feeder
A holder was designed to support a roll of typing paper and a hacksaw blade was installed to go over the paper within the carriage so it could serve as a cutting bar. White bond paper rolls were purchased from IBM. The design is simple and the cost of fabrication and installation is minimal. FFI #1

W-80
SCI
Quadriplegia
Vocational Counseling

PROBLEM: Unable to "depress" to relieve skin pressure
A rehabilitation counselor who is a C5 quadriplegic had to ask colleagues to help lift him to relieve sitting pressure every two hours during the work day. He sought help to find a way that he could be independent in meeting this need.

Positioning Aid

SOLUTION: Reclining wheelchair
A reclining wheelchair was fabricated by the Center with a head rest that automatically moves into position during the reclining movement. A low chair back is maintained when the user is upright to enable him to use the back for support when leaning forward. The recliner obviated the need for periodic lifting and also reduced fatigue. FFI #9

W-81
Cerebral Palsy
Athetosis/ataxia Right Hemiplegia, Left
Vocational Counseling

PROBLEM: Unable to work efficiently/independently as vocational counselor
A state VR agency counselor was referred by her employer for evaluation and recommendations which would render her more independent and efficient in her work. Her physical dysfunctions included left side paralysis, right side athetosis and ataxia, and dysarthria. The employer's goals were to see her become less reliant on others in the office, more organized, and more productive.

Work Area Modifications

SOLUTIONS: Work site modifications
A conventional work table was replaced by two long, narrow (18" x 6') tables to accomodate her limited reach, arranged in an "L" shape; tape recorders, telephones, and other devices were permanently fixed in convenient locations to eliminate their motion when she uses them; mouthstick holders were placed at three locations to provide easy access; a touchswitch which activates without pressure was added to her dictating unit; a gooseneck clamp was installed for positioning of her dictation microphone; the room air conditioner was relocated so she could reach the on-off switch; a slanted reading stand with a lip at the lower edge and a swinging lever at the top to hold pages and a non-slip desk mat were provided. Much of the equipment was commercially available (e.g., tables, "Dycem" desk mat) and the remainder was fabricated in the Center's laboratory. FFI #9

W-82
Cerebral Palsy
Movement Athetoid
Weighing

PROBLEM: Unable to place objects on scale
A worker with cerebral palsy, athetoid type, has severely impaired hand and arm function. His uncle sells packaged nails to hardware stores and specialty shops, and has offered his nephew a contract if the price is competitive. The job requires the packaging of nails to a required weight. The worker's poor grasp and coordination would not permit him to quote a competitive price.

Jig/Fixture

SOLUTION: Adjustable electromagnet
An electromagnet was obtained from an automobile air conditioner clutch and fitted with a handle. Power was supplied at a safe low direct current voltage by an inexpensive battery charger. With the power on, the magnet lifted a fixed quantity of nails from the bulk

supply. The captured nails were placed over a funnel which rested on a scale. By turning off the current, the nails fell into the package. A quick check on the weight indicated whether a nail or two had to be added for the exact weight. A competitive packing speed was the result. FFI #4

W-83
Quadriplegia
Welding

PROBLEM: Unable to operate heat control on Heliarc welding machine
A quadriplegic VR client who uses a stretcher-type wheelchair needed a modification of the heat control on a Heliarc welding machine that would permit him to operate it.

Machine Modification

SOLUTION: TIG Torch with 25 foot cable
The Southwest Research Institute (an IMPART collaborator) identified a commercially available system which the client was able to operate. The TIG Torch with 25 foot cable, ON/Downslope Switch P/N 366592-1 Model #E-20 is available from Robert Welding Sales/Service in Orlando, FL., for approximately $48.00. FFI #13

W-84
Crutch/Cane Users
Work Area Safety

PROBLEM: Safely storing canes/crutches
Work plant safety officers frequently object to workers placing their canes or crutches on the floor near their desks or other work sites.

Appliance Storage

SOLUTION: Holders for ambulation aids
There are several workable solutions. Some prefer to hold canes between their legs and not put them on the floor. Fishing rod holders sold in tackle stores will hold a cane securely. These holders attach to a desk surface with screws or glue. Broom holders work well for aluminum crutches. Velcro fasteners on a strap are also easy to use and are adjustable. Any of these solutions should satisfy the safety officer. FFI #4

W-85
Blindness, Legal
Writing

PROBLEM: Unable to see to read and write
Worker with partial vision (no vision left eye, 20/800 right eye, and almost normal visual field right eye). This worker could only write by bringing his right eye to within 3 cm. of the writing paper. This meant that he was forced to bend over a horizontal desk surface or an inclined surface. In either case this put undue stress on his back, caused him to bend into unnatural and uncomfortable positions, and made it very difficult for him to answer a telephone and take notes on the conversation while the latter was in progress.

Sensory Aid

SOLUTION: CCTV
The worker obtained a closed circuit TV system that permitted him to solve all the difficulties listed above, and also to take advantage of the fact that a CCTV system makes it possible to vary the magnification of the image on the monitor screen and to control the image contrast, brightness, and polarity. The ability to change image polarity was particularly helpful, because for this worker and for many other partially sighted persons viewing white symbols on a black background involves far less eye fatigue than viewing black symbols on a white background.

Quality CCTV systems can be purchased from Apollo Lasers, Inc., 6357 Arizona Circle, Los Angeles, CA 90045, and Visualtek, 1610 26th Street, Santa Monica, CA 90404. There are several models of CCTV systems offered by each manufacturer as well as various optional accessories. CCTV systems vary in price between about $1,000 and $2,000. FFI #5

W-86
Blindness, Legal Writing

PROBLEM: Reading, taking notes, copying from what is being read
Worker with partial vision (no vision in left eye, 20/800 right eye, almost normal visual field right eye) found it very difficult to read and take notes on or copy from what he was reading.

Sensory Aid

SOLUTION: Double x-y platform
Worker obtained double x-y platforms that he uses in conjunction with the closed circuit TV systems in his two offices. The double x-y platforms replaced the single (or usual) x-y platforms that were part of his CCTV systems (and should be an integral part of any competently manufactured CCTV system). These double x-y platforms have two rectangular platforms that move together in the x — or left/right direction, and that move independently of one another in the y — or toward the user/away from the user direction. The double x-y platform in effect remembers the line upon which the user left off reading (writing) when the user shifts over to writing (reading) and also while he is writing (reading).

At the present time double x-y platforms are not available commercially. A detailed illustrated description of double x-y platforms is given in R-1614 "A Double X-Y Platform for Randsight-Type Instruments" by R.W. Clewett, S.M. Genensky, and H.E. Petersen. This report can be obtained from the Publications Department, The Rand Corporation, 1700 Main Street, Santa Monica, CA 90406. FFI #5

RESOURCES FOR FURTHER INFORMATION AND SOLUTIONS

FOR FURTHER INFORMATION (FFI) ENTRIES

#1 The Cerebral Palsy Research Foundation of Kansas
Rehabilitation Engineering Center
P.O. Box 8217
Wichita, KS 67208

Cerebral Palsy Research Foundation of Kansas, Inc. is administered by a Board of Directors and John F. Jonas, Jr. as Executive Vice President. There are three main programs under this organization: Rehabilitation Engineering Center, Center Industries Corporation, and Timbers Housing Project. In addition, on-going contracts with the State Department of Special Education and Department of Health interface Cerebral Palsy Research Foundation with children's programs.

The Rehabilitation Engineering Center was established as a joint research activity of Cerebral Palsy Research Foundation and the College of Engineering of Wichita State University. Cerebral Palsy Research Foundation of Kansas provides the client environment through Center Industries Corporation and the HUD — Timbers Housing Project for this research.

Center Industries Corporation is the setting wherein physically disabled clients can be employed and integrated into the manufacturing scene. This is done through engineering adaptations for various clients, enabling them to perform tasks as proficiently as able-bodied employees.

The Timbers Housing Project provides physically disabled persons with the opportunity to live as independently as possible. The Timbers is composed of apartment units arranged in fourplexes and sixplexes with dining and recreational facilities easily accessible to all residents.

Ask for further information on a solution abstracted from their publication series titled: "Problem Solving with Rehabilitation Engineering — Tech Briefs".

#2 Sensory Aids Foundation
399 Sherman Avenue, Suite 4
Palo Alto, CA 94306
(415) 329-0430

The Sensory Aids Foundation is a non-profit foundation associated with Telesensory Systems, Incorporated, 3804 Hillview Avenue, Palo Alto, CA 94304, (415) 493-2626, known for producing such devices as the Optacon and the Talking Calculator. The Foundation operates a vocational program through an Innovation and Expansion grant, emphasizing the creation of employment opportunities for blind and partially sighted persons. All placements are supported by sensory aids which either augment vision or provide alternate forms of information for totally blind persons.

For further information, contact the following staff:

Employment Development Program
Susan Phillips, Program Coordinator
Dan Van Horn, Vocational Specialist
Yvonne Russell, Engineering Consultant

Training Program
Jerry Kuns, Program Coordinator
Sharon Conner, Vocational Specialist, Trainer

Ask for further information on a solution abstracted from their publication series titled: "Sensory Aids Foundation Quarterly Reports.".

#3 **Sensory Aids Foundation**
399 Sherman Avenue, Suite 4
Palo Alto, CA 94306
(415) 329-0430
— OR —
American Foundation for the Blind
15 West 16th Street
New York, NY 10011

Ask for a copy of their joint publication titled: "Sensory Aids for Employment of Blind and Visually Impaired Persons: A Resource Guide".

#4 **A.G. Garris**
Assistive Device Consultant
California State Department of Rehabilitation at
Rancho Los Amigos Hospital
7601 E. Imperial Highway
Downey, CA 90242
(213) 922-7733

A.G. Garris writes a column titled "Dear A.G." for the house organ of the California State Department of Rehabilitation. For more than five years, counselors have written to him with questions regarding assistive device needs of their clients and responses are published in the departmental newsletter. In addition, A.G. Garris and contract consultants (engineers) will evaluate and develop solutions to problems when feasible.

#5 **Center for the Partially Sighted**
Santa Monica Hospital Medical Center
1250 Sixteenth Street
Santa Monica, CA 90404
(213) 451-1511, x 2393

The Center for the Partially Sighted provides direct services for in-patients and out-patients of the Santa Monica Hospital Medical Center, and also has an active research program. The research program is oriented toward developing means of utilizing residual vision as much as possible.

#6 **The Institution for Rehabilitation Research**
Texas Medical Center
1333 Moursund Avenue
Houston, TX 77030
(713) 797-1440
Contact: Dr. O.B. Billings

This is a multi-institutional program which is operated cooperatively by the Baylor College of Medicine, The Institution for Rehabilitation and Research, and Texas A & M University. The Center's efforts are focused on developing devices and methodologies which will reduce the risk of pressure-induced tissue breakdown. The major program areas are: tissue pressure management, clinical device development, implant materials, and support of the Vocational Industrial Center. In the last, industrial engineering is applied to the productivity problems that limit the vocational potential of severely disabled clients. Work stations are designed to minimize the effects of a client's limitations and special aids are developed to permit disabled workers to work at normal or near normal levels of outp[illegible].

#7 Institute for Information Studies
400 N. Washington Street, Suite 202
Falls Church, VA 22046
(703) 533-0383

The Institute for Information Studies is a non-profit organization involved in research for and about handicapped individuals and their problems. For the cases cited, please contact Dr. Carolyn Vash at the Institute.

#8 Mickey Christiason
Recreation Therapy Department
Rancho Los Amigos Hospital
7601 E. Imperial Highway
Downey, CA 90242

The Recreation Therapy Department at Rancho Los Amigos Hospital is strongly oriented toward preparing Hospital patients to use their leisure time constructively and rewardingly after they leave the Hospital, rather than entertaining them while they are there. In the course of this, numerous techniques and devices have been developed to help given individuals, which have proved to have more general applicability.

#9 Northwestern University
Rehabilitation Engineering Program
Room 1441
345 East Superior Street
Chicago, IL 60611
(312) 649-8560

The core area of this NIHR funded rehabilitation engineering center is internal joint replacement. A secondary area of concern is the development of assistive devices for severely disabled people. In both areas, both research and development and clinical service programs are conducted.

#10 Development, Evaluation and Clinical Engineering Center
Veterans Administration Prosthetics Center
252 Seventh Avenue
New York, NY 10001
Contact: Saleem Sheredos

The VA Prosthetics Center operates development, evaluation, and service delivery programs which are national in scope in response to the needs of all VA Medical Centers; its interest is broad spectrum in rehabilitation engineering, having special programs in prosthetics, orthotics, orthopedic shoes, and all types of technical aids. Development efforts are primarily focused on the problems of severely disabled persons with spinal cord injuries. Its automotive vehicle program is focused on the development of standards for adaptive equipment for disabled drivers. The Center also emphasizes mobility systems, particularly wheelchairs, both in development and evaluation. The VAPC also conducts educational and training programs for rehabilitation engineering specialists.

#11 Rehabilitation Engineering Department
Woodrow Wilson Rehabilitation Center
Fishersville, VA 22939
Attn: Reuven Kruger

The major engineering effort at Woodrow Wilson Rehabilitation Center revolves around rehabilitation engineering service delivery as opposed to pure research activities. Here the concerns are to deliver a product or consultation service to an individual within a defined time frame and at a minimum of cost. Rehabilitation Engineering is also concerned with helping to facilitate the transition of research developments to actual consumer usage.

Rehabilitation Engineering at Woodrow Wilson Rehabilitation Center also serves as a source for referral to rehabilitation engineering centers, Veterans Administration facilities, universities, and other sources of pertinent rehabilitation engineering information.

Rehabilitation Engineering's first concern is with service to the clients at the Center. However, limited statewide service is available depending on the circumstances of each individual case.

#12 **Florian Caligiuri, Executive Director**
California Association of the Deaf
1507 21st Street, Suite 102
Sacramento, CA 95814
TTY (916) 443-2833 Voice (916) 443-3604

The California Association of the Deaf is an information and referral and advocacy agency for people who are deaf or hearing impaired. A special area of interest is that of communication aspects of deafness, and much of the information provided relates to sensory aids for people with impaired hearing.

#13 **Carol Whitcraft, Ph.D., Project Director**
Project IMPART
Texas Rehabilitation Commission
118 E. Riverside Drive
Austin, TX 78704
(512) 447-0367

IMPART is a problem solving project funded as a research utilization laboratory by the National Institute of Handicapped Research. Problems of handicapped persons in work settings and in independent living situations are submitted to the IMPART project rehabilitation engineers. These problems are then matched with commercially available solutions or with prototypes developed through other resources. IMPART serves the Federal Region VI five-state area of Texas, New Mexico, Oklahoma, Arkansas and Louisiana. IMPART is an acronymn for Innovative Matching of Problems to Available Rehabilitation Technology.

#14 **Project Threshold**
Rancho Los Amigos Rehabilitation Engineering Center
7601 E. Imperial Highway
Downey, CA 90242

Supported jointly by the California Department of Rehabilitation and NIHR, the purpose of Project Threshold is to assist severely disabled clients of the California State Department of Rehabilitation (DR) in becoming more employable by increasing their independence. Client services include independent living skills, mobility evaluation, and worksite evaluation and modification. The Project makes use of the Rehabilitation Equipment Demonstration Unit — a model home stocked with technical aids for trial use by disabled consumers.

#15 **Special Assistance to the Handicapped**
Pacific Telephone
500 E. Main St. Room 202
Alhambra, CA 91801
Voice: (800) 242-4565 TTY: (800) 242-4570
Director: Ray Disinger

This is a new special assistance program for telephone users with physical disabilities developed through the joint efforts of Pacific Telephone, the California Department of Rehabilitation, the California Public Utilities Commission, and various other public service groups. It attempts to solve telephone usage problems posed by mobility or hearing disabilities. At the time of this writing, the program is available only in the Los Angeles 213 area code area.

Interagency Conference on Rehabilitation Engineering
Co-sponsored by the Veterans Administration and the Rehabilitation Services Administration in the Department of Health, Education and Welfare

1979 Chairmen: Anthony Staros, Veterans Administration
Joseph E. Traub, Rehabilitation Services Administration

This annual interagency conference was initiated in Washington, D.C. in 1978, and was held in Atlanta, Georgia in August of 1979. The major purpose of the conference is to expedite information dissemination on rehabilitation engineering to professional, consumer, government and other agencies. Descriptions of devices and methods which can facilitate independence and promote a higher quality of life for those who have physical or sensory disabilities are offered through instructional courses, plenary sessions, technical workshops, exhibits, and sessions reporting research and development. The conference is scheduled for Toronto, Canada in 1980, but thereafter will be held in Washington, D.C. in even numbered years, and in different cities around the U.S. in odd numbered years.

International Abilities Unlimited Exposition
2945 Harding, Suite 107
Carlsbad, CA 92008
(714) 729-0853

General Manager: Richard C. Wooten

This is an annual exposition of goods and services for the disabled from around the world. Sponsored by the California Association of the Physically Handicapped, it was held for the first time in Los Angeles in the Spring of 1979, will be held in Los Angeles in 1980, but may then be held in other cities on the West Coast. This Exposition includes major employers of people with disabilities as well as assistive device exhibits.

International Disabled Expo
32 W. Randolph Street
Chicago, IL 60601
(312) 346-0752

General Manager: R.J. Powell

This is an annual show of products and services of interest to people with disabilities. Sponsored by the Paralyzed Veterans of America, it has been held for two years in Chicago (1977 and 1978) and was held in Houston in 1979. In the future, it is to be held in various cities around the U.S. In conjuction with the Expo a series of conferences and lectures are conducted on subjects of interest to Expo attendees.

Assistive Devices Purchasing and Supply Catalog
Published by the Texas Rehabilitation Commission IMPART Demonstration Center
1138 Airport Boulevard
Austin, TX 78702
(512) 926-1661

The Demonstration Center is a centralized collection of many devices which represent the latest products of rehabilitation engineering. Their catalog is published for the purpose of providing rehabilitation personnel with references for submitting purchase requests for devices for their clients. Items which are starred (*) are not available for inspection at the Demonstration Center but are included for information purposes. All other items listed are available at the Center.

For further information contact John O. Robinson, Assistant Commissioner for Purchasing and Supply, at the above address or telephone number.

Sensory Aids for Employment of Blind and Visually Impaired Persons: A Resource Guide; two editions; Large print and Braille, $7.50.

This 210 page catalog of sensory aids useful in the employment of blind and visually impaired persons was developed through the joint efforts of the Sensory Aids Foundation and the American Foundation for the Blind. A vast array of devices is described in terms of Function, Employment Application, Description, Vendor, Availability, and Price. It is well indexed, in terms of Employment Area, Manufacturers and Vendors, Research and Development, and Devices.

It is available from either:

Sensory Aids Foundation
399 Sherman Avenue, Suite 4
Palo Alto, CA 94306
(415) 329-0430
or
American Foundation for the Blind
15 West 16th Street
New York, NY 10011

Sensory Aids Foundation Quarterly Report (Formerly the Optacon Fund Report)

This newsletter is published by the Sensory Aids Foundation as a means for disseminating information regarding the progress of the vocational programs operated by the Sensory Aids Foundation. The change of name reflects a name change on the part of the Foundation itself in 1977. The reports recapitulate some of the placements accomplished by the Foundation and describe the sensory aids used to expedite in making them possible.

Copies my be obtained by writing to:

Sensory Aids Foundation
399 Sherman Avenue, Suite 4
Palo Alto, CA 94306
(415) 329-0430

Rehabilitation Engineering Center (REC)
Children's Hospital at Stanford
520 Willow Road
Palo Alto, CA 94304
(415) 327-4800

Director: Maurice A. LeBlanc

The core area of research under NIHR funding as a REC is controls and interfaces for rehabilitation engineering systems for severely physically limited people. The Center also has five service areas: prosthetics, orthotics, mobility devices, communication devices, and prevention of tissue damage. In addition to the research and direct service programs, an education and training program is conducted in which help for families as well as training of patients and professionals is stressed.

Rehabilitation Engineering Center
Moss Rehabilitation Hospital
12th Street and Tabor Road
Philadelphia, PA 19141
(215) 329-5715

Director: A. Bennett Wilson, Jr.

The core area for research at the REC-MRH is locomotion and mobility for physically disabled individuals. Clinical evaluations are carried out for other groups, and a Rehabilitation Engineering Clinic is conducted to determine the proper role of the engineer in service delivery. Education programs concerning the results of their work are conducted, as well as a publication program designed to make easily available the results of their work to clinicians, researchers, counselors, etc.

For further information contact either Serge Minassian, M.E., or Nathanial Mayer, M.D.

Rehabilitation Engineering Center
Smith-Kettlewell Institute of Visual Sciences
and
Department of Visual Sciences, University of the Pacific
2232 Webster Street
San Francisco, CA 94115
(415) 567-0667 & 563-2323

Director: Lawrence Scadden, Ph.D.

The core area of the San Francisco Rehabilitation Engineering Center is research and evaluation activities relating to sensory aids for blind and visually impaired individuals. The interdisciplinary staff includes experimental psychology, Biophysics, neurophysiology, and electrical, electronic, mechanical, and computer engineering. An informal consortium of local organizations working with blind and visually impaired individuals has been established including Smith-Kettlewell, Pacific Medical Center, University of California School of Optometry, University of California Medical School, University of the Pacific School of Engineering, Stanford University School of Engineering, San Francisco State University Department of Special Education, Veterans Administration Western Blind Rehabilitation Center, California State Department of Rehabilitation, Sensory Aids Foundation, San Francisco Lighthouse for the Blind, and Telesensory Systems, Inc. Recent work has been focused on vocational rehabilitation engineering, graphic displays, paperless Braille, orientation and mobility research, information storage and retrieval, low vision research, evaluation of sensory aids developed elsewhere, deaf-blind communications, and informal dissemination.

Texas Rehabilitation Engineering Center
1333 Moursund
Houston, TX 77030
(713) 797-1440

Program Director: Thomas A. Krouskop, P.E., Ph.D.

This is a multi-institutional program which is operated cooperatively by the Baylor College of Medicine, The Institution for Rehabilitation and Research, and Texas A&M University. The Center's efforts are focused on developing devices and methodologies which will reduce the risk of pressure-induced tissue breakdown. The major program areas are: tissue pressure management, clinical device development, implant materials, and support of the Vocational Industrial Center. In the last, industrial engineering is applied to the productivity problems that limit the vocational potential of severely disabled clients. Work stations are designed to minimize the effects of a client's limitations and special aids are developed to permit disabled workers to work at normal or near normal levels of output.

Veterans Administration Prosthetics Center (VA National Rehabilitation Engineering Center)
252 Seventh Avenue
New York, NY 10001

Director: Anthony Staros

See: FFI #10

INDEXES

The two indexes which follow are included to assist the reader who desires to selectively obtain information about specific case examples. They are intended to help readers find possible solutions to problems which occur in their caseloads on a day-to-day basis; as such, they serve as a quick reference tool for counselors and supervisors who have specifically observable client needs.

The Problem Index is organized by impairment etiology and areas of functional limitation. Major headings represent the impairment etiology, e.g., "Spinal Cord Injury"; subheadings indicate the functional limitation e.g., "Quadriplegia." In some cases, the etiology is not reported by the participating project. Where such information is not available the functional limitation is utilized as the major heading. Where appropriate, cross-references are used to direct the reader to other relevant index terms.

The Solution Index is organized by the general device name which was utilized to solve a specific performance problem, e.g., "Dexterity Aid." Subheadings indicate the specific performance activity for which the device was utilized. An example of how the Solution Index is organized is: A dexterity aid which is used to assist a client in eating is indexed under the major heading "Dexterity Aids" and the subheading "Eating." Cross-references are utilized **within** subheading groups to indicate alternate performance terms. For example, under "Jig/Fixtures" the subheading "Precision Assembly" indicates "see Assembly." The phrase tells one to look under the subheading "Assembly" within the major heading "Jig/Fixtures."

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The Institute for Information Studies, under a grant from the National Institute of Handicapped Research, developed four documents on topics of priority concern to the rehabilitation community:

NEW LIFE OPTIONS: INDEPENDENT LIVING AND YOU

(Co-produced with the Institute for Rehabilitation and Research — TIRR)

This 16-page booklet explores the new options that are now available to disabled individuals seeking an independent lifestyle of their own making. It traces the history of the movement, describes selected independent living programs and their services and discusses the new opportunities for consumers provided by the 1978 Amendments to the Rehabilitation Act. The booklet includes a section on sources of technical assistance and financial support for independent living programs.

MAKING FRIENDS AND INFLUENCING THE MEDIA

Consumer organizations and advocacy groups will be assisted by this manual on developing public relations programs. Unlike most PR manuals, this one focuses on how to influence the image of disabled people as they are portrayed in the mass media. The manual takes a practical "how-to-do-it" approach and provides examples of press releases, tip sheets and other tools of the trade. Included in the manual is a section on media regulations and how they can be used by consumer groups to access the media.

REHABILITATION ENGINEERING SOURCEBOOK

The first of an on-going series, it presents 150 case examples in which the application of technology has solved specific work-related or other functional problems of people with vision, hearing, or physical-motor disabilities. Designed as a reference work primarily for vocational rehabilitation counselors and work supervisors, it contains useful information for other rehabilitation professionals and rehabilitation engineers as well. Special features include: Guidelines for Formulating Problem Statements and Sources of Further Information for readers wishing to consult with contributors on technological solutions for their own clients' and subordinates' functional problems; and a loose-leaf format to which subsequently published materials can be added.

WORK DISINCENTIVES

Written primarily for the policy maker and others with a vested interest in the issue, this document synthesizes the available research-based knowledge on disincentives to work. Policy options are offered and pros and cons are delineated. This document is prepared by Dr. Monroe Berkowitz, well-known authority on the subject.

The above documents are available while supplies last from the Institute for Information Studies. (Order form enclosed) Copies are also deposited in:

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8th and Varnum Streets, NE
The Catholic University of America
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SUPPLEMENT I

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ABBREVIATIONS AND ACRONYMS

Activities of Daily Living	ADL
Amyotrophic Lateral Sclerosis	ALS
Blood Pressure	BP
Closed Circuit Television	CCTV
Everest and Jennings	E&J
Houston Independence Through Engineering	HITE
Lower Extremity(ies)	L.E.
Muscular Dystrophy	MD
Rehabilitation Engineering Center	REC
Spinal Cord Injury(ed)	SCI
Telecommunications Device for the Deaf	TDD
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ACKNOWLEDGEMENTS

The response to the initial *Sourcebook*, which attempted to organize available information for utilization purposes, indicated the tremendous utility of such a publication. *Supplement I* was compiled to reflect the comments and suggestions of many helpful, informal advisors who consulted with us after the initial distribution of the *Sourcebook*. We particularly appreciate the numerous agencies, projects, and individuals listed in the section "Resources for Further Information and Solutions" who contributed additional case examples for inclusion in this *Supplement*.

Staff members at the Institute for Information Studies who contributed to this publication are *Elizabeth Pan*, President; *Carolyn Vash*, Senior Associate; *Marjory Boyer Crane*, Senior Research Associate; and *Mark Troppe*, Research Assistant. Many thanks also to the excellent support staff, consisting of *Suzanne Stotler, Sandy Bailey, Annette Harrington, Barbara Butler,* and *Susan Kolodziej*.

INTRODUCTION

This package of materials constitutes the first supplement to the *Rehabilitation Engineering Sourcebook*. It includes over 100 additional case examples chosen to illustrate a variety of technological solutions to problems encountered in rehabilitating people with physical or sensory disabilities. Add these supplementary (blue) pages at the back of the appropriate sections of the original (white) pages in your *Sourcebook* loose-leaf binder.

To integrate this supplementary material into your binder, please take the following steps:

- Remove the original Table of Contents and List of Illustrations and replace it with the revised versions found with this *Supplement*.
- Insert this introductory page immediately following page I-2 in the original (white) pages. As you can see, it is appropriately paginated as I-3.
- Note that there are no supplementary pages for Part II.
- Insert supplementary (blue) pages III-67 through III-117 immediately following page III-66 in the original (white) pages.
- Insert supplementary (blue) pages IV-4a through IV-4f immediately following page IV-4 in the original (white) pages.
- Delete page IV-7 from the original (white) pages. It is an inadvertently incomplete listing of NIHR-sponsored rehabilitation engineering centers. Replace it with blue pages IV-7 through IV-11 which is a complete listing.

To make use of *Supplement I*, simply review pages I-1 through III-2 of the original *Sourcebook;* the format and indexing system are unchanged. Please make note of the fact that the "FFI #" at the end of the text of each case example stands for "For Further Information" and the number refers you to the appropriate entry in the listing(s) of case example contributors. If the case example about which you want more information is in the white pages, look up the FFI # in the listing in the original (white) pages (pages IV-1 through IV-4). If the case example about which you want more information is in the blue pages, look up the FFI # in the listing in the supplementary (blue) pages (pages IV-4a through IV-4f). Many contributors have indicated that they will welcome inquiries from *Sourcebook* users, and thus prefer to maintain brevity in the case examples.

Sourcebook users who wish to submit case examples which illustrate innovative (not commercially available) technological solutions they have developed or of which they are aware, are invited to do so for future Supplements to the *Rehabilitation Engineering Sourcebook*. Submissions should be sent to:

RES SUPPLEMENT II
Institute for Information Studies
200 Little Falls Street, Suite 104
Falls Church, VA 22046

Accompanying line drawings or photographs are welcomed.

A-27
Cerebral Palsy
Limited Hand Dexterity
Dispensing Liquids

Dexterity Aid

Problem: Difficulty pouring liquids
A client with cerebral palsy has limited hand dexterity and coordination due to spasticity. This creates difficulty opening and handling cardboard liquid containers.

SOLUTION: Milk spout
To avoid having to open the container in the traditional manner, a "milk spout" was utilized. A "milk spout" is a device similar to the spouts used for car oil cans that are pressed into the can to open it and provide a pouring spout. Using the "milk spout" the client simply pushes the spout into the top of the container. Because of his difficulty in handling the container to pour it, he empties the container into a plastic liquid dispenser employing a faucet. In this way the client need only handle the cardboard container once and can dispense the liquids simply by pressing the faucet.

The dispensing containers can be purchased for $5.29 each from: Miles Kimball, 41 West Eighth Avenue, Oshkosh, WI 54906, catalog number 7805-1.

The spouts are available in many supermarkets and variety stores.

FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #1.

A-28
Muscular Dystrophy
Shoulder Contractures
Wheelchair Propulsion

Mobility Aid

PROBLEM: Inability to reach power wheelchair control
A client with contractures of his shoulders, making them fixed in 90° abduction, received a new powered wheelchair. He was unable to reach the control box in its traditional position, attached to the arm rests.

SOLUTION: Control box repositioned to chest level
The control box was repositioned so that it was at chest level within the client's range of motion. This was accomplished by using metal tubing bent to the proper configuration with a tube bender used for bending electrical conduit. The control box was attached at one end of the tube while the other rested in a clamp attached to the arm rest. This clamp allows the client to swing the control box away so that he can work at a desk.

FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FII #1.

A-29
Quadriplegia
Postpolio
Toilet Transfer

Mobility Aid

PROBLEM: Inability to do unassisted toilet transfers
A woman paralyzed from polio but having fair use of one arm and hand retired from full-time work as a rehabilitation administrator to write textbooks. With no secretary present to help her with toilet transfers, she found it necessary to hire a part-time attendant. This was costly, and it was difficult to find people who could schedule their work time in the middle of the day. (Family assistance was available mornings and evenings.)

SOLUTION: Self-lift
The "Self-Lift," previously produced by Holo Industries, proved to be the solution. A 3¼" × 6" aluminum "I" beam attached to the ceiling joist provides the track, and an industrial hoist provides the lifting power. Lifting straps are placed under each leg and around the back, and a light-weight electronic box provides pushbutton control of vertical and horizontal movement. Holo Industries has been dissolved, but a comparable lift is being produced by one of the former owners under the name "Care Lift." It currently retails for approximately $2,500.00. Cost and availability informa-

tion can be obtained from Care Medical Industries, 715 North Los Robles Avenue, Pasadena, CA 91104, (213) 795-9131.

FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #3.

A-30
Muscular Dystrophy
Generalized Weakness
Eating

PROBLEM: Inability to eat independently
In the advanced stages of Duchenne muscular dystrophy, an individual still wished to feed himself as much as possible. Because of the weakness, he was unable to elevate his upper extremities enough to bring food to his mouth.

Positioning Aid

SOLUTION: Elevating food tray
Fabricate an elevating lap tray to support arms at mouth level so that the person can scoop food toward his mouth for eating. The elevating lap tray was made by modifying a folding card table. The card table was cut in half, reduced in width, and the legs were used as supports to allow the lap tray to be adjusted from wheelchair arm rest height to a height right under the axilla. With this device, the person was able to drink milk from a carton and eat food such as potatoes by scooping the food toward his mouth.

FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #6.

A-31
Spinal Cord Injury
Hypertension
Quadriplegia, Postural Hypertension
Sitting

PROBLEM: Inability to assume sitting position during bed-chair transfer
Physical therapy and nursing staff needed a way to transfer a 265 pound C-4 quadriplegic from bed to a (reclining) wheelchair. The individual could not be brought to a sitting position during transfer because of blood pressure problems.

Mobility Aid

SOLUTION: Transfer sling
Construct a transfer sling with a removable framework. The canvas sling could be tucked under the individual as he was rolled from one side and then, as he was rolled back onto the canvas sling, it could be pulled out for coverage under the other side of his body. Once the canvas sling was in place underneath the individual, the framework could be slid into containment sleeves and fastened to an over-bed, lifting apparatus. He could then be transferred to a fully reclining wheelchair where the sling frame would again be removed and the canvas left in place until the return procedure. The individual could be brought to a sitting position gradually while in the wheelchair. With the use of this sling mechanism, heavy lifting, and therefore a necessity for numerous attending personnel, was minimized.

FOR FURTHER INFORMATION: See the section on"Resources for Further Information and Solutions," FFI #6.

A-32
Severe Rheumatoid Arthritis
Generalized Weakness

PROBLEM: Weakness due to rheumatoid arthritis
The individual referred was unable to get up from the floor after a fall and needed means to call someone for assistance. Because of this fear, she has been considering moving into a nursing home.

Communications Aid

SOLUTION: Cordless telephone
Due to the monthly expense involved, multiple telephone extensions or Medalert were considered infeasible. However, there are now several "cordless" telephones available on the market which, although initially expensive, do not involve additional monthly charges above the cost of a

single telephone line. The user is able to carry the hand-held remote unit wherever she may go around the home (garden, patio, basement) and still be able to make or receive telephone calls.

FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #7.

A-33
Any Etiology
Loss of Arm Function
Eating

Mobility Aid

PROBLEM: Inability to feed self independently
Persons with little or no upper extremity function need means to feed themselves independently.

SOLUTION: Eating aid
An eating aid has been designed and developed to be operated by the user's head, neck, and mouth function. (If a person has trunk mobility, use of the eating aid is made easier.) This eating aid was designed to be used on a daily basis or as a back-up device when assistance was not available for feeding.

The user operates the eating aid by using the mouth to remove a fork or spoon from a revolving disk utensil holder mounted within functional range. The user then spears or scoops the desired portion of food and places the utensil back on the holder. The holder is then rotated by nudging it with the chin, nose, cheek, etc. until the fork (or spoon) faces the user for food access. Beverages and soups can be accessed through straws. The eating aid is not commercially available at this time; however, construction plans and an assembly manual are available (at a charge of $5.00) from:

Northwestern University
Rehabilitation Engineering Program
Room 1441
345 East Superior Street
Chicago, IL 60611
Phone: (312) 649-8560

FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #12.

A-34
Any Etiology
Limited U. E.
Fine Manipulation

Dexterity Aid

PROBLEM: Inability to do fine manipulation
Persons with limited or no upper extremity function need means of independent control over vocational and avocational activities such as writing; turning pages; typing; sorting objects; pushing low resistant buttons, levers, or dials; painting and playing games (i.e. cards, checkers, etc.).

SOLUTION: Modular mouthstick system
A mouthstick system has been designed and developed by the Northwestern University Rehabilitation Engineering Program in conjunction with the Rehabilitation Institute of Chicago, Occupational Therapy Department. This mouthstick incorporates low-cost, commercially available components into a modular system which allows fitting the device to suit the user's needs. The system allows the user to independently change at least three types of terminal appliances such as pen, push-button tip, or page-turning friction tip. The mouthstick shaft is a low-cost, lightweight, durable fiberglass arrowshaft which can be cut to suit the user's functional range and needs. A dental prosthesis (mouthpiece) can be attached to the shaft in several ways and should be fit and fabricated by a knowledgeable dentist. A simple latching device mounts to the terminal end of the arrowshaft which provides an adjustable low-friction connector for securing a desired appliance tip. An appliance tip holder positions an assortment of three tips for independent

user access, and also supports the mouthstick shaft when it is latched to any one of the tips. The appliance tip holder can be mounted to either a desk top or wheelchair. The modular mouthstick system is not commercially available at this time, however, construction plans are available (at a charge of $3.00) from:

Northwestern University
Rehabilitation Engineering Program
Room 1441
345 East Superior Street
Chicago, IL 60611
Phone: (312) 649-8560

FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #12.

A-35
Severe Quadriplegia
Positioning Objects

PROBLEM: Finding a suitable lapboard for a reclining wheelchair
Some persons capable of using limited upper extremity functions or a mouthstick to perform vocational and avocational activities from their reclining wheelchairs require the use of a lapboard. The need for a lapboard which did not require mounting to the retractable armrests or interfere with the reclining function of the wheelchair led to the use of a commercially available lapboard mounting bracket system.

Positioning Aid

SOLUTION: Clamp-on lapboard for reclining wheelchair
Wheelchair lapboard mounting clamps available from Fred Sammon's, Inc. (catalog number BK-6308 "Quad-Quip": Universal Desk Arm Lap Tray Kit) were attached to a clear plexiglas lapboard designed and fabricated by the Northwestern University Rehabilitation Engineering Program and the Rehabilitation Institute of Chicago Occupational Therapy Department. The lapboard mounts very easily and quickly to the user's desk-type wheelchair armrest posts, and remains in position during reclining functions. Clear plexiglas allows the user to view feet during mobility maneuvers and also to view the legbag to determine fullness. The clear lapboard may be contraindicated when visual perception problems, such as figure-ground discrimination problems, make it difficult to locate or manipulate an object on the lapboard. A plan for forming the plexiglas lapboard is available from:

Northwestern University
Rehabilitation Engineering Program
Room 1441
345 East Superior Street
Chicago, IL 60611
Phone: (312) 649-8560

FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #12.

A-36
Severely Limited U.E. Function
Turning Pages

PROBLEM: Inability to turn pages of reading material
Persons with little or no upper extremity function may not be able to turn pages independently without the use of a technical aid. There are commercially available page turners; however, many require precise book set up and are not consistently effective due to the large variety of book sizes and textures of the pages. Also, many do not allow the user to turn pages in reverse or to "flip through" other sections of the book when desired.

Dexterity Aid

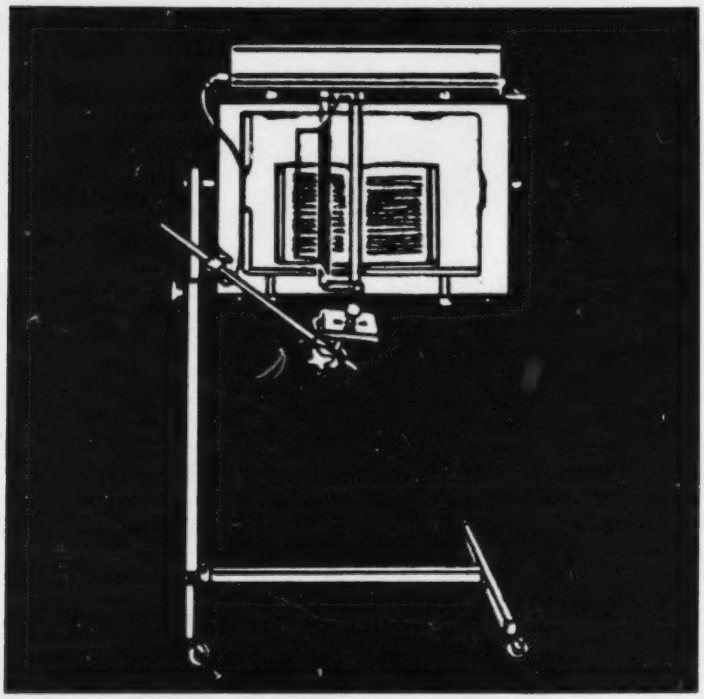
SOLUTION: The GEWA Page-Turner
The GEWA Page-Turner is an electronic aid which can help persons with limited or no upper-limb functions to turn pages of various-sized books and

magazines. It can turn a single page both forward and backward and can gather up several pages at one time for turning in either direction. The design of the GEWA permits the user to control its functions. If something is going wrong, such as a page crumpling, the user can reverse the action, correct the problem, and then continue. The GEWA comes with a choice of three controls: joystick/chin control, puff-and-sip control, and push-button control.

For further information on the GEWA Page-Turner, contact:

Zygo Industries, Inc.
P.O. Box 1008
Portland, OR 97207
or
GEWA Rehabteknik AB
Box 3059
S-16103 BROMMA, Sweden
Telephone 468/373717

FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #12.



A-37
Any Etiology
Paraplegia
Device Control

Environmental Control

PROBLEM: Need to mount hardware to lap tray

The need to mount device-control switches, character displays, vocational hardware, and other aids on a wheelchair lap tray in an easily adjusted removable fashion occurs commonly.

SOLUTION: C-clamp with ball joint

A commercially available clamp was found whose principal feature is a lockable ball joint. Any object which can be threaded with a 1/4 hr -20 hole may be supported over a large range of tilt and swivel angles and locked securely in the desired orientation and position. Meant for supporting cameras, it is

available in most photography stores as one of a line of accessories made by Capro. The approximate cost is $10.00.

FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #13.

A-38
Any Etiology
Weakness
Device Control

PROBLEM: Switch control with restricted strength and range of motion
Switch closure is a common means of activating communciation and environmental control systems. The force and/or movement required by many switches exceed the capability of many disabled people.

Jigs/Fixtures

SOLUTION: Adjustable control switches
A simple control switch was designed which permits convenient reproducible adjustment of the travel and force required for activation. These quantities may be altered independently. The unit is designed around a standard low-force microswitch and built from readily available plastic stock with no special tools. Plans are available from the Harvard-M.I.T. Rehabilitation Engineering Center.

FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #13.

A-39
Cerebral Palsy
Quadriplegia
Eating

PROBLEM: An individual with cerebral palsy who is quadriplegic wanted to be able to eat a sandwich at his own pace without assistance during the process

Mobility Aid

SOLUTION: Adjustable sandwich holder
A sandwich holder was fabricated from clear thermoplastic sheet stock. The device is secured to a table with "C" clamps. When the row of bites closest to the client has been eaten, a movable slide supporting the sandwich can be pushed back with the chin making the next row of bites accessible.

FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #14.

A-40
Spinal Cord Injury
C-4 Quadriplegia
Bathing

PROBLEM: Use of bath chair difficult and unsafe
A C-4 quadriplegic male is bathed by his wife. Transfers are manual because the conventional lifts (i.e. Hoyer) do not work well given the type of bedroom furniture and take too long to accomplish. The wife has experienced some minor back problems as a result of the manual handling.

Mobility Aid

SOLUTION: Ambulance gurney
An ambulance gurney with height adjustment, back angle adjustment, waterproof pad, and drop side rails was purchased. The man is rolled onto the gurney, constrained by the side rails in transit and during turning, wheeled into the roll-in shower, and elevated if necessary for washing. The used gurney cost $200.00.

FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #15.

A-41
Spinal Cord Injury
C-4 Quadriplegia
Environmental Control

PROBLEM: Environmental control during daily activities and emergency
A C-4 quadriplegic male needs more control over his environment during daily living activities especially related to emergency situations. With only minimal hand function and good mouth stick usage, an appropriate system was necessary.

Environmental Control System

SOLUTION: Three "off-the-shelf" devices
The environmental control system provided included the sixteen-station unit plus four adaptors for general activities (Sears, $100.00); automatic door opener with light push-button remote control attached to the lap tray near the usable hand (Automatic Door Openers, San Carlos, California, $900.00); and a six-station automatic emergency dial telephone unit with light, push-button remote control activation, and manual override (Medi-Call, (408) 245-2076, $400.00), also on the lap tray but appropriately positioned not to interfere with other activity.

FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #15.

A-42
Cerebral Palsy
Quadriplegia
Dermatophytosis
Bathing

PROBLEM: Inability to hold and bathe client
A device that would assist an attendant in bathing a 25-year-old client weighing 75 pounds is needed. The client is quadriplegic as a result of cerebral palsy and has dermatophytosis.

Holding Aid

SOLUTION: Lightweight bathing aid
Several items were investigated prior to purchase of the Supporta Bather, manufactured by Modular Medical Corporation, 177 East 87th Street, New York, NY 10028, and available for approximately $50.00. This lightweight folding bathing aid has an adjustable bucket sling seat which grips the tub surface with suction cups. This aid enabled the attendant to use both hands to bathe the individual.

FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #16.

A-43
Blind
Telling Time

PROBLEM: Inability to distinguish a.m./p.m.
A blind individual needed a clock which will specifically indicate time as a.m. or p.m.

Sensory Aid

SOLUTION: Talking alarm clock
The American Foundation for the Blind, 15 West 16th Street, New York, NY 10011, was identified as the source for a "Talking" Alarm Clock. Using pushbuttons, the blind individual can be told, via speech, the correct time (a.m. or p.m.) and date.

FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #16.

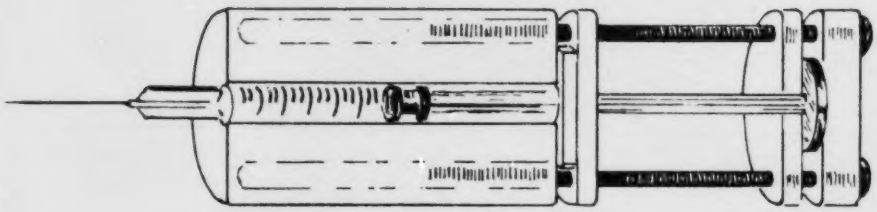
A-44
Diabetes
Reduced Sensation
Insulin Injections

PROBLEM: Inability to hold disposable syringes dependably
Client complained of frequently dropping syringe while trying to give himself injections thus ruining the syringe.

Dexterity Aid

SOLUTION: Syringe holder
Weight and bulk were added to the syringe by clipping it into a holder. The syringe is easily removed and inserted making an audible click as it snaps into position. Sketches or plans are available upon request.

FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #17.



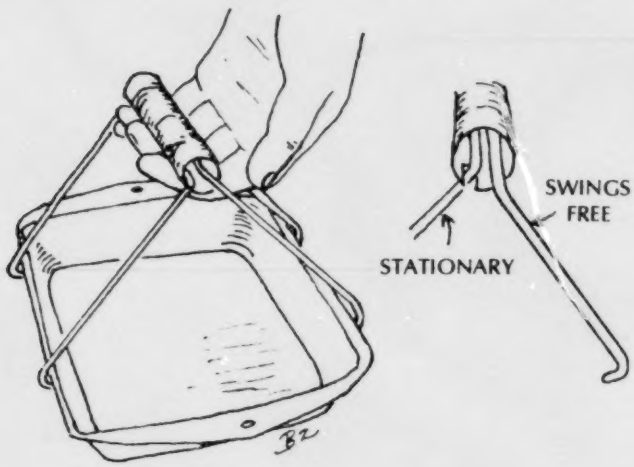
A-45
Quadriplegia
Reduced Hand and Arm Function
Lifting Hot Pans from Stove

PROBLEM: Inability to lift small roaster from oven
Because of weakness in his hands and the need to use the opposite arm for support, this individual could not remove the roaster from the oven.

Lifting Aid

SOLUTION: Adjustable-opening pot lifter
Small roasters, cake tins and other small pans with a definite lip can be picked up with this lifter. It is made of a plastic pipe union and two pieces of 1/8" stainless steel wire. One set of arms is fixed to the handle; the other swings free to grip the lip of the pan.

FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #17.



PAN AND POT-LIFTER

A-46
Diabetes
Reduced Sensation
Temperature Indication

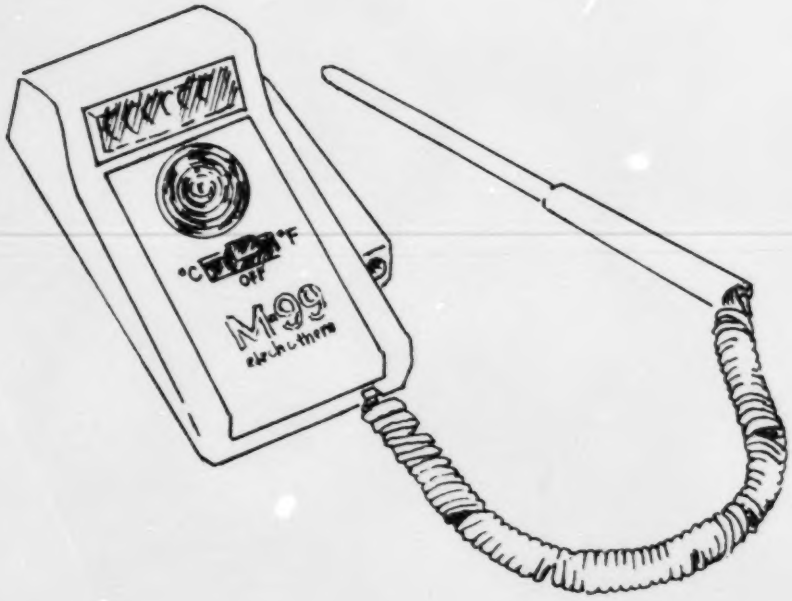
PROBLEM: Inability to tell water temperature
A person with diabetes has lost a significant level of temperature sensitivity and was concerned about burning himself while showering and washing dishes.

Sensory Aid

SOLUTION: Use digital temperature display and probe
Healthkit sells an accurate, all-purpose digital thermometer (battery operated) with an attached probe. It gives readings from +32°F to 230°F in just 10 seconds. The individual has found it very useful. The price is approximately $40.00.

EXPERIMENTAL SOLUTION: Liquid crystal display
Liquid Crystal Technology, Inc., 14692 Wicks Boulevard, San Leandro, CA 94577, sells individual crystals for a wide range of temperatures. We have

Digital Temperature Display and probe



experimented with sticking a 40°C and a 50°C crystal on faucets which warn the user of excessive temperatures. A small strip of bent aluminum could also be used for mounting the crystals; the aluminum strip could then be clamped onto the faucet or have a hole drilled in it and held in place with the nut holding the aerator.

FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #17.

A-47
Any Etiology
Limited Hand or Arm Function
Unlocking Doors

PROBLEM: Inability to operate conventional door locks
Because of limited hand or arm function, many clients are unable to insert and/or turn doorkeys.

Dexterity Aid

SOLUTION: Push-button doorlock
The Presto-Matic Lock Co., Inc., 3048 Industrial 33rd Street, Fort Pierce, FL 33450, manufactures push-button combination locks. There are several types with different features. The base price is approximately $75.00.

FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #17.

A-48
Polio
Quadriplegia
Door Opening

PROBLEM: Inability to open apartment door
A client with polio, who had no upper extremity extension, was able to get into her apartment with no problem, but she was unable to pull the door open from the inside.

Dexterity Aid

SOLUTION: Door opener
A small electric motor was used to wind a nylon cord which was hooked to a lever-type door handle via a pully. Once the system was activated by the client hitting a low-mounted wall switch with her wheelchair footrest, the door would open and the client was able to exit. The door would hit a kill switch and then the door's weight would slowly unwind the nylon cord, permitting the door to fully close. The system did not impede the use of the door by other individuals.

FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #18.

A-49
Muscular Dystrophy
Paresis
Sitting/Breathing

PROBLEM: Inability to maintain trunk stability while sitting
A client with severe M.D. was only able to sit in a forward position. To support him in this position, an ill-fitting chest plate had been fabricated. It was cutting into his legs and making breathing difficult.

Positioning Aid

SOLUTION: Trunk support
It was decided that the idea of a chest plate was good as only this type of device could provide the necessary support. What was needed was a way to make it fit better and, in turn, support the plate better. This was done using a bead bag, evacuating the air, and taking a plaster cast of the mold. T-Foam was used as a cushion which was adhered to an ABS shell, formed over the plaster mold. This was attached to the wheelchair with light-weight steel rods and straps. The whole thing is easily removable for transfers.

FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #18.

A-50
Quadriplegia
Incontinence
Leg Bag Emptying

PROBLEM: Inability to empty leg bag
Full-time workers with severe upper extremity limitations find it difficult to empty their leg bags during the workday. Some even limit their fluid intake to minimize the need for this, which can aggravate urinary problems.

Urinary Collection Device

SOLUTION: Urinary container
2½- or 1½-gallon containers have been fashioned after a client's design. They are formed of plastic or from battery boxes and contain a polyethylene flexible bag. The assembly is suspended beneath the seat of an electric wheelchair and connects to conventional catheter linkages.

FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #19.

A-51
Spinal Cord Injury
Sensation Loss
Protecting Skin

PROBLEM: Inability to perceive skin pressure
Patients who have sensory loss due to spinal cord injury or disease need to be reminded when they should relieve the pressure during extended sitting to prevent tissue breakdown.

Sensory Aid

SOLUTION: Substitute sensory stimulation
The substitute sensory stimulation system is a method for providing biofeedback via a visual display and percutaneous electrical stimuli to wheelchair bound patients. It is comprised of three major subsystems: (1) a set of pressure-sensing elements; (2) an electronic unit containing the controls, displays, pressure-signal conditioners, decision-making elements, and electrical stimulators; and (3) gauze-covered button-type electrodes mounted on a velcroelastic belt. The substitute sensory stimulation system

protects patients with decreased or no sensation in the sacral and ischial areas against the development of ischemic ulcers due to prolonged sitting. Named "REP" (reminder of excessive pressure), it alerts the patient when s/he has exceeded prescribed pressures for longer than a safe time.

FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #4.

A-52
Spinal Cord Injury
High-level Quadriplegia
Operating Controls

Dexterity Aid

PROBLEM: Inability to access environmental control system
High-level spinal cord injury patients often have difficulty accessing the interface unit for environment control systems.

SOLUTION: Phonically activated autopositioner
This is a compact, portable system which allows a patient who can whistle or hum to control certain electronic systems situated within the environment. The device is mounted on the headboard of a bed, or it may be positioned on a table edge for wheelchair usage. The patient whistles or hums to summon or retract the environmental control.

The environmental control interfaces are often either continually in the patient's field of vision or must be moved into position by a nurse or attendant before the patient can take control of his environment. These characteristics limit the usefulness of the traditional environment control system, particularly for patients who live in their own home or apartment.

FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #4.

C-17
Any Etiology
Hearing/Speech Impairment
Telephones

PROBLEM: Inability to contact telephone operator
Deaf or speech-impaired persons have been unable to communicate directly with telephone operators to get help with ordinary operator-assisted calls. Local telephone companies offer various services and devices depending upon their regulatory agencies and legislation. Nationwide operator service has not been available to TDD users with hearing or speech impairments.

Communication Aid

SOLUTION: Toll-free assistance line for TDD users
Twenty-four hour operator service has been implemented for TDD users on a toll-free number 800-855-1155 or 1-800-855-1155. This service is from one TDD to another TDD and is not for voice contact or interface of machine to voice. These operators do not handle emergency calls but will assist in all common services offered to voice customers. Contact your local business office for details.

FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #2.

C-18
Any Etiology
U.E. Impairment
Telephone Dialing

PROBLEM: Inability to dial telephone numbers
Motion-impaired individuals are sometimes unable to dial a number on either rotary or push-button telephones. Automatic dialers and other assistive devices may solve some problems, but random dialing may still be impossible.

Dexterity Aid

SOLUTION: Manual operator or operator assistance
Some telephone companies offer a service whereby an operator is directly connected to the customer to do his or her actual dialing. Different names are used to identify this service including "manual operator" or "operator assistance." Check with your local telephone company business office to learn what special services are offered.

FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #2.

C-19
Quadriplegia, Bedfast
Telephone Dialing

PROBLEM: Inability to dial telephone
A bedfast quadriplegic uses a combination of telephone assistive devices including a Speakerphone® connected directly to an operator (manual operator service) because he is unable to dial by any practical method. The apartment complex where he resides installed security gates controlled only by dialing a given number from inside the apartment. When he is alone daily his visitors or attendants cannot be admitted, because the security-release mechanism can only be operated by a coded tone from his telephone. The manual operator service eliminates all tones as it is a direct connection.

Communication Aid

SOLUTION: Separate Touchtone® pad
A separate Touchtone® pad was wired to emit the correct release tones when one elongated button is pushed. When properly positioned, this control can be operated regardless of the telephone usage. Check with your local telephone company business office for availability.

FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #2.

C-20
Cerebral Palsy
Dysarthria
Speaking

PROBLEM: Inability to speak
A cerebral palsy patient with total body involvement needs a communication system, predominantly for social needs. Prior to this time, she has utilized a word board. This is extremely slow, however, and requires listeners to stay in very close proximity during all of her communication attempts to read what she is communicating.

Communication Aid

SOLUTION: Form-a-Phrase
This device was felt to be appropriate based on her present reading level and motor skills. The Form-A-Phrase is an electronic word board, accessed by a magnet, which, when entries are selected, automatically vocalizes that selection. This system can accommodate some spastic or extraneous movements because the user can slide the marker over unintended words or phrases without activating the system, by adjusting the time control appropriately. This device is available from Sci-Tronics, Inc., 523 South Clewell Street, P.O. Box 5344, Bethlehem, PA 18015, for approximately $1,800.00.

FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #8.

C-21
Head Injury
Dysarthria
Speaking

PROBLEM: Inability to speak
A young man three years post-head trauma presents severe dysarthria in addition to reductions in memory function. He presently has no oral speech for communication, and greatly needs an assistive device which would allow him to communicate within a variety of contexts.

Communication Aid

SOLUTION: Canon Communicator
The Canon is a lightweight device (approximately 10 ounces) which can be hand-held, attached to the wrist, or fit in a pocket. As entries are made on the key guard, letters and symbols are produced on a paper display. The device is available through Telesensory Systems, Inc., 3408 Hillview Avenue, P.O. Box 10099, Palo Alto, CA 94304, for approximately $600.00.

FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #8.

C-22
Head Injury
Impaired Communication
Speaking

PROBLEM: Inability to verbalize
An individual is unable to transmit his needs and desires through speech—secondary to severe abdominal and oral-facial weakness and structural damage of the facial bones and neck muscles.

Communication Aid

SOLUTION: Canon Communicator
A portable device which functions as a typewriter readily provides a written message on tape and provides a natural means for social interaction. It can also be used for educational purposes. Available from: Telesensory Systems, Inc., 3408 Hillview Avenue, Post Office Box 10099, Palo Alto, CA 94304. Estimated price: $600.00.

FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #8.

C-23
Any Etiology
Quadriplegia and Inability to Speak
Communication

PROBLEM: Urgent need to communicate without speech or limb function
Neurology wards and others in acute care settings have frequent sudden needs for simple, effective communication aids for severely impaired patients. Minimal cost, zero maintenance, and ease of modification are essential.

Communication Aid

SOLUTION: Eye-movement communication board
A modification of the ETRAN eye-movement communication board was de-

veloped for a particular stroke patient and has been replicated repeatedly for others. Do-it-yourself fabrication is simple for nontechnical people for approximately $10.00. Plans are available from the Harvard-M.I.T. Rehabilitation Engineering Center and units are available (at higher cost) from Zygo Industries, Inc., P.O. Box 1008, Portland, OR 97207.

FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #13.

C-24
Any Etiology
Quadriplegia and Inability to Speak
Communication

PROBLEM: Need for interface to nonvocal communication system
To control a nonvocal communication and environmental control system (M.I.T. UNICOM), a high spinal cord injured woman in an independent living setting needed an interface allowing ten distinguishable acts without limb control.

Controls

SOLUTION: "Harmonica" of puff-sip tubes
An array of five tubes supported in a plastic piece curved to match head rotation was designed and built. Puffing or sipping on each tube provides ten distinct inputs detectable by standard pressure-activated switches. This interface is easily adapted to various systems. Plans are available from the Harvard-M.I.T. Rehabilitation Engineering Center.

FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #13.

C-25
Any Etiolcgy
Mobility Impairments
Summoning Help

PROBLEM: Inability to summon help
Severely physically handicapped persons in an independent living setting required an emergency alarm if stranded outside in severe weather.

Communication Aid

SOLUTION: Garage door openers
Commercially available garage door openers were utilized. Signals are received at several locations and are decoded by ROM to determine the general location on the grounds from which the signal is sent. Two inch-square actuation pads on the sending units make it possible for the unit to be actuated with very simple gross movement.

FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #14.

C-26
Any Etiology
Severe Disability
Dexterity Impairments
Summoning Help

PROBLEM: Need to summon help
Individuals in an independent living setting having a variety of types and severity of disabilities required an emergency call switch to be placed in the bathroom. The location of the switch needed to be tailored to each individual using the facility.

Positioning Aid

SOLUTION: Movable switch
A large toggle switch, available commercially as a substitute for a standard wall switch, was chosen. This was mounted in a plastic box fitted with plastic ties for varying the location.

FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #14.

C-27
Cerebral Palsy
Quadriplegia
Summoning Help

PROBLEM: Inability to summon help
An individual who is severely disabled by cerebral palsy needed access to a switch while in bed to call for aid/service in an independent living setting.

Dexterity Aid

SOLUTION: Gross control pull switch
A plastic towel ring was suspended at a convenient location above the bed and was connected to a pull switch. Only a very gross movement is required to activate such a switch.

FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #14.

C-28
Amyotrophic Lateral Sclerosis
Speaking

PROBLEM: Inability to communicate
An individual with amyotrophic lateral sclerosis is ambulatory though partially paralyzed. He is unable to speak or write. He has exhibited maladaptive behavior due to his frustration at being unable to communicate.

Communication Aid

SOLUTION: Canon Communicator
Arrangements were made with several vendors to demonstrate appropriate, portable communication devices. Following the individual's trial use of some devices, the Canon Communicator was purchased by the client's family. Available through Telesensory Systems, 3408 Hillview, Palo Alto, CA 94304, this device is a hand-held keyboard with a strip-printer function. Since acquiring the Canon, the client's behavior has not been a problem.

FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #16.

C-29
Vocal Cord Injury
Speaking

PROBLEM: Inability to project voice
An individual involved in an auto accident sustained throat and chest injuries resulting in vocal cord damage. Unable to project his voice, he needs a method or device for speech amplification.

Communication Aid

SOLUTION: Voice amplifier
Following consultation with the individual's speech therapist, a voice amplifier was recommended for trial use. Appropriate devices are available from Communicaid, Decatur, IL 62522 and the Bioengineering Department, 1333 Moursund, Houston, TX 77030.

FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #16.

C-30
Cerebral Palsy - Athetoid
Dysarthria
Speaking

PROBLEM: Low intelligibility of speech
An individual is severely disabled by athetoid cerebral palsy. Though he has had speech therapy and continues his efforts to speak, his speech is extremely dysarthric. Less than ten percent of his speech is intelligible to the unfamiliar listener.

Communication Aid

SOLUTION: Handivoice 120
IMPART, working cooperatively with Southwest Research Institute, recommended that the Handivoice 120, a synthetic voice generator, be acquired for the individual. The communication device is used in the scanning mode and operated with an adapted foot pedal switch. The Handivoice 120 is available through HC Electronics, 250 Camino Alto, Mill Valley, CA at a cost of $2,300.00.

FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #16.

C-31
Any Etiology
Communication Disorders

PROBLEM: Inability to speak
A counselor works with clients who cannot speak and who require alternate means for face-to-face communication. He requested information on communication devices which display messages in a form suitable for conversation.

Communication Aid

SOLUTION: VIP communicator
The VIP communicator met the requirements of the problem originator. This small, hand-held keyboard with an eight-character LED display has a remote display which can be attached to the shirt pocket promoting face-to-face communication. This communication aid is available from Automated Data Systems, Inc., P.O. Box 4062, Madison, WI 53711, at an approximate cost of $250.00.

FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #16.

C-32
Cerebral Palsy
Dyskinetic Arm Movements
Accessing Easicorder

PROBLEM: Accessing commercially available Easicorder
A student had purchased the Easicorder from Prenki-Romich, which she wanted to use in the classroom, but she had no practical way of positioning it on her wheelchair. She also had difficulty placing and retrieving tapes from the tape drive.

Dexterity Aid

SOLUTION: Bracket plus modified lid
A bracket for the recorder and a modification to the lid for the tape drive solved the problem. A bracket to hold the recorder on the wheelchair armrest, which also positioned the switch and held the remote microphone in a protected position, was made to fit the E & J desk-arm of her powered chair and is easily removed. Sketches and photos are available upon request.

FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #17.

C-33
Polio
Quadriplegia
Telephone Dialing

PROBLEM: Inability to use telephone while in bed
A client with polio was unable to use a telephone while lying down. Her husband had experienced an epileptic seizure requiring immediate medical attention. The possibility of this recurring had been interfering with the client's ability to sleep.

Dexterity Aid

SOLUTION: Remote switch
The client did not feel comfortable using any of the commercially available emergency dialing devices because she wanted to be able to speak directly with whomever she had "dialed." Since she is not able to move when lying down, but did have grasp ability in one hand, a remote switch, wired into a commercially available telephone with auto-memory dialing, was provided.

FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #18.

H-6
Cerebral Palsy
Quadriplegia
Opening Cans

Dexterity Aid

PROBLEM: Inability to operate can opener
A man who is quadriplegic as a result of cerebral palsy lives in his own apartment and wanted to use a commercially available electric can opener. This was not practical due to his limited ability to use only one hand. (This appears to be a common problem.)

SOLUTION: One-hand can opener prototype
Make a prototype modification of a commercially available electric can opener to permit the opening of various can sizes using only one hand, and use this prototype to design a modification kit to be available for other clients. The modified can opener requires: a large base plate for rigid mounting; a modification of the spring for the cutter wheel; a counterbalanced, extended operating handle; protection of the electric switch from undue pressure; a supporting fixture for each can height that will be opened; and additional support of the plastic opener body to withstand the forces that may be exerted on it.

FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #14.

H-7
Brain Damage/Injury
Dominant Arm Paralysis
Opening Cans

Dexterity Aid

PROBLEM: Inability to open cans
Following brain surgery, an individual lost the function in her dominant hand and arm. She has made good progress in performing household activities with the remaining upper extremity, but is unable to open cans independently.

SOLUTION: One-hand can opener
A can opener designed for one-hand use is commercially available from Fred Sammons, Inc., Box 32, Brookfield, IL 60513. It consists of a standard electric can opener mounted on a spring-loaded table which holds the can in the cutter head.

FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #16.

M-9
Cerebral Palsy
Incoordination
Controlling Wheelchair

PROBLEM: Inability to operate standard joystick controls
A 20-year old woman with cerebral palsy was unable to control her standard powered wheelchair with a standard joystick control. Her best source of control was head motion.

Controls

SOLUTION: Specialized seating and control interface
An occupational therapist experienced in the seating problems of persons with cerebral palsy assessed the problem. Once the proper seating was achieved, the young woman was referred to a provider of specific systems for persons with cerebral palsy (Romich, Beery, and Bayer, Inc., R.D. 2, Box 191, Shreve, OH 44676). A joint assessment by the provider and the Rehabilitation Engineering Division of the Department of Physical Medicine and Rehabilitation at University Hospital in Ann Arbor, Michigan produced the recommendation to use head-activated switches for forward, left, and right control of her wheelchair, elbow movement for reverse motions, and forearm movement for scanning control. Estimates were given and payment arrangements were made through the state services for crippled children. The equipment was fitted through the Rehabilitation Engineering Division of University Hospital. (Efforts to obtain a communications system integrated with the above system are being explored by the Rehabilitation Engineering Division of University Hospital in cooperation with the Artificial Language Laboratory at Michigan State University in East Lansing.)

FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #10.

M-10
Paraplegia
Above-Knee Amputee, Right
Wheelchair Loading

PROBLEM: Inability to lift wheelchair
A paraplegic client is weak and quite small, weighing only 90 pounds. Balance is further impaired by an AK amputation. She needs assistive equipment to lift her wheelchair into the backseat of her car independently.

Lifting Aid

SOLUTION: Wheelchair loader
An automatic wheelchair loader available from Wright-Way, Inc. of Garland, TX was recommended and purchased for the individual. The wheelchair loader track is mounted across the top of the car's interior above the center posts. When the control switch is activated, the lifting arm slides across the track to a position for convenient connection to the wheelchair. A second switch lifts the wheelchair and activates the lifting arm back across the track, sliding the wheelchair into the back seat. The system allows for convenient unloading from the back seat as well. The loader is available for approximately $800.00.

FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #16.

M-11
Cerebral Palsy
Spastic Quadriplegia
Electric Wheelchair Use

PROBLEM: Inability to use joystick control
A person with spastic cerebral palsy, who is also nonvocal, was seeking a way to become independently mobile. He was not able to use a joystick or any of the commercially available control systems.

Mobility Aid

SOLUTION: Electric wheelchair control
The client has very good head control and finger flexion in one hand. He uses the gross-finger control to operate an encoding communication system. Using these two movements, a combination head (direction) and hand (forward and reverse) control was developed and attached to an electric wheelchair in place of the joystick.

FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #18.

M-12
Quadriplegia
Carrying Work Materials

PROBLEM: Difficulty carrying materials
A worker had difficulty carrying office files and other materials while propelling his chair.

Wheelchair Adaptation

SOLUTION: Snap-on tray
A transparent snap-on tray was heat-formed from polycarbonate plastic. It provided secure carrying space without obstructing vision while maneuvering the wheelchair.

FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #19.

M-13
Spinal Cord Injury
Quadriplegic
Wheelchair Operation

PROBLEM: Cosmetic concern
A high level quadriplegic is unaccepting of wheelchair controls which utilize conventional head controls.

Mobility Aid

SOLUTION: Shoulder position control
A control device has been developed which senses the position of the shoulder and uses this movement to control proportionally the wheelchair direction and velocity. An electronic module directly interfaces this controller to conventional powered wheelchairs using a plug-compatible configuration. Four C4 quadriplegics have been fitted with this control system.

FOR FURTHER INFORMATION. See the section on "Resources for Further Information and Solutions," FFI #21.

M-14
Reis Syndrome
Limited U.E. Function
Wheelchair Operation

PROBLEM: Inability to use conventional wheelchair control
A severely involved patient with Reis syndrome is unable to use a conventional hand or chin controller to drive a powered wheelchair. He has limited hand-forearm control with minimal finger flexion in one hand and shoulder extension but no active shoulder flexion in the opposite arm.

Mobility Aid

SOLUTION: Modified wheelchair control
A conventional E & J joystick hand control was used to govern turning and forward or reverse velocity. A switch operated by finger flexion enabled him to choose whether rearward excursion of the joystick controlled forward or reverse wheelchair movement. An electronics module which was plug-compatible with his E & J 3P chair was developed to perform the control functions. The subject has used this controller regularly for the past nine months.

FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #21.

M-15
Any Etiology
Quadriplegia
Propelling Wheelchair

PROBLEM: Inability to propel manual chair
Some quadriplegic individuals need a mechanism that permits them to utilize their shoulder musculature to propel a manual wheelchair when using a powered chair is inconvenient.

Mobility Aid

SOLUTION: Wheelchair propulsion device
An adaptive propulsion device which fits onto a standard wheelchair has been developed. It is a mechanical system that does not require the person to use active elbow flexion or grip to propel the chair. The only function that is required is in the triceps and/or shoulder.

FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #4.

R-18
Cerebral Palsy
Total Dependence on Power Chair
Camping

PROBLEM: Wheelchair not sufficiently mobile or sturdy
A client with cerebral palsy enjoys joining the family in hiking and other outdoor activities. Due to the severity of his disability, he needs proper positioning and restraint while in the power chair. Commercially available wheelchairs have not stood up to the stress caused by the terrain that the family covers, resulting in structural deformations and wheel fractures.

Mobility Aid

SOLUTION: Wheelchair for outdoor use
A custom wheelchair was designed and developed for the client primarily for outdoor use. The design incorporates a frame welded together from lightweight tubing. The wheels used for the chair are high strength 20" bicycle wheels. The seating unit was custom molded for the individual by Tufts Bio-engineering Department and is the same as that used on the client's power chair. General specifications of the chair: total weight 28 pounds; cost of materials excluding the seat, under $100.00; total fabrication time, 20 hours.

FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #1.

R-19
Spinal Cord Injury
Paraplegia
Swimming

PROBLEM: Need to enter water in wheelchair
A paraplegic individual involved in an exercise program enters the swimming pool in her wheelchair. She wanted a wheelchair with good tolerance to such exposure.

Mobility Aid

SOLUTION: Stainless steel wheelchair
The problem originator was furnished information on stainless steel wheelchairs that are commercially available from Stainless Medical Products, 9389 Dowdy Drive, San Diego, CA 92126.

FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #16.

R-20
Any Etiology
Wheelchair Use
Motorcycle Riding

PROBLEM: Inability to ride motorcycle in the usual manner
Generally, riding a motorcycle requires both legs not only for operating the gear shift, brakes and kick start, but also for balance of the bike as well as balance of the driver. Many wheelchair users want to enjoy this recreation, however.

Mobility Aid

SOLUTION: TRY-CYCLING platform sidecar unit for motorcycle
The design of this commercially available unit incorporates a special sidecar for the driving of a motorcycle from the platform sidecar while seated in one's wheelchair. It uses Honda automatic motorcycles. The sidecar platform is designed to accommodate a wheelchair; plus, all the controls needed to operate the motorcycle (steering, accelerator, braking controls, etc.) have been mounted on the platform sidecar. The units can be individually modified. It is possible to have an able-bodied passenger riding on the regular cycle seat. Available from TOMCO Enterprises, Inc., 7701 Hoover Road, Valley Center, KS 67147, (316-755-2269 or 264-8086) for $3,650.00. Price includes sidecar with fiberglass front fairing and new 400 cc Hondamatic motorcycle. Normal-to-near-normal hand strength and dexterity are required for safe operation of the units.

FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #20.

T-15
Arthrogryposis
Severely Limited ROM
Attending Classes

Modified Work Site

PROBLEM: Inability to use conventional school desk
A student with severely limited joint ROM was unable to sit at a conventional school desk and use her hands for school work.

SOLUTION: Special school desk
A steel base from a school desk built by American Seating was used as the main support for the modified desk. A 1" thick wood top, 23" × 21" covered with Formica, was used as the work surface. A small wooden seat with an ABS plastic back was placed at the right height so that the child could sit/stand and functionally use her arms and hands.

FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #18.

T-16
Spinal Cord Injury
C-4 Quadriplegia
Education/Studying

Modified Work Site

PROBLEM: Effective studying and educational development
A C-4 quadriplegic male is attending a local junior college and is enrolled in the field of data processing. The severely limited hand function makes computer card, batch input impossible, extends studying time because of reliance on tutors, and makes home studying very inefficient.

SOLUTION: Micro-computer system, custom study area
The micro-computer system is flexible in software rather than relying on hardware. The basic components of the system are an Apple II microprocessor with 32K RAM, dual floppy disks, video monitor, and printer. This allows for more independent and efficient studying, more direct experience with computer programming to promote learning, and can be used as a long-term vocational tool. In conjunction, a double rotary desk unit was supplied to house the typewriter, tape recorder, reference books and stands, the telephone, and the control switches. The cost of the microprocessor system components and desk unit were approximately $4,000.00 and $700.00 respectively. Another $1,000.00 was required for some custom programming of the Apple II system.

FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #15.

T-17
Post-polio
Quadriplegia
Computer Programming

Dexterity Aid

PROBLEM: Inability to hold down shift key
A small, post-polio individual has use of her right hand only. Confined to a wheelchair, she is a college student training to become a computer programmer. The college offers training on TRS-80 computer terminal models which do not have a lock down shift key. The individual was unable to effectively hold the shift key down and still reach all the letters, numbers, and symbols on the keyboard using only one hand.

SOLUTION: Wire in alternate action switch
Southwest Research Institute, working cooperatively with the IMPART Project, secured an alternate action switch from the keyboard manufacturer, HI-TEK Corporation of Garden Grove, CA. The modification was accomplished in the following manner:

1. Remove the keyboard cover.
2. Select an area on a printed circuit board which is void of any circuits. Lay out the hole pattern, specified by the switch manufacturer (HI-TEK Corp.), just to the right of the space bar.
3. Drill the mounting and contact through holes in the PC board. Secure a switch using two #4 self-tapping screws.

4. Wire the alternate action switch in parallel with the existing right-hand shift key.
5. On the existing keyboard cover, extend the space bar cutout (RH) to include the added keycap.
6. Secure a cover to the keyboard with existing hardware and functionally test the keyboard with the computer.

FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #16.

T-18
Deaf
Diagnosis and Lecture Attendance

PROBLEM: Inability to hear heart and lung sounds and lectures
A deaf medical student needed technical assistance to improve his communication capabilities. Specific problem areas included:

1. Observing and interpreting patient physiologic signs;
2. Note-taking during class lectures;
3. Lipreading in classroom situations where lighting was inadequate.

Sensory Aids

SOLUTION: Electronic Stethoscope, head-mounted lamp
Information on electronic stethoscopes (available from any ABBEY Medical Equipment; Hal-Her Company, Long Island, NY; Edmund Scientific, Barrington, NJ) and visual displays for observing ECG, heart sounds, and other derived or acquired physiologic signs was provided (available from Stophting Company, Chicago, IL; Spectrum Imtronix, Inc., Fresno, CA). A head-mounted lamp for increasing illumination level of the mouth area of the lecturer was suggested; a prototype was fabricated by Southwest Research Institute, and an improved prototype was built by state vocational rehabilitation personnel. This device improved the lipreading capability of the client under poor lighting conditions. (A special portable closed-circuit television system which would enable the lipreader to function no matter which direction the speaker faces was also considered. Such a system might prove to be of great value in classrooms for deaf children where an "oralist" approach is used.)

FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #16.

T-19
Cerebro-vascular Accident
Hemiplegia
Emptying Catheter Bag

PROBLEM: Inability to empty leg bag
A catheter clamp that could be operated with one hand is required. The client is a right-handed hemiplegic with limited use of his left hand. He was unable to enter job training because he could not empty his catheter bag independently. The clamp he was using required the use of both hands.

Dexterity Aid

SOLUTION: One-hand catheter clamp
Several appropriate clamps are commercially available, one of which is a drain valve available from MED-AMCO Medical Service, Dallas, TX. This valve may be opened by pulling gently with one finger and closes when the ring is released. The individual can easily operate the acquired clamp and was able to enter the employment training program.

FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #16.

T-20
Blindness
Class Note-taking

PROBLEM: Inefficient information handling
A blind graduate student needed a more efficient way of handling information. His slate and stylus were disruptive in class and slow to use. His brailled notes were cumbersome, bulky, and difficult to organize. Translation of brailled information into print demanded typing for use by sighted people.

Sensory Aid

SOLUTION: Cassette Braille device

The student was employed part-time during his doctoral work. His employer provided him with a VersaBraille™ System, and an electronic "cassette Braille" device. The system provides word processing capabilities in Braille, search and retrieve functions for specific information, quiet, inconspicuous and rapid note-taking, and interface capability with other electronic equipment. He, therefore, can print out his computer Braille information on a Daisy Wheel Printer.

FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #22.

P-10
Degenerative Joint Disease
L.E. Impaired
Wheelchair Loading

PROBLEM: Inability to load wheelchair into car
The client needed assistance to load an electric wheelchair into her station wagon.

Lifting Aid

SOLUTION: Auto wheelchair loader
The easiest solution would have been to have the client obtain a van with a lift. However, she had just purchased the station wagon and could not afford the price of a van even with a trade-in. An electric winch-powered telescoping lift system was designed and fabricated. The wheelchair frame was converted to a full recliner, which allowed it to fit in the back. To lift the chair, the winch cable is connected to the chair. The winch is turned on, lifting the chair above the height of the station wagon floor. A gear motor is then used to recede the telescoping arm back into the car. Once in place, the winch is reversed, lowering the chair to the floor of the car. The procedure is reversed to get the chair from the car.

FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #18.

P-11
Multiple Congenital Anomalies
Bilateral L.E. Amputee
Driving
Positioning Aid

PROBLEM: Inability to see over hood of car
An adult woman with multiple congenital anomalies, independent in A.D.L. and all other aspects of life and employed, was unable to drive because she could not see over the hood of even a subcompact car.

SOLUTION: Support system
A body mold was taken using a bead bag and evacuating the air to lock the beads in place. A plaster bandage cast was taken of the resulting form. This, in turn, had foam, ABS plastic, and a Naughahyde covering vacuum-formed over the cast. The necessary height adjustments were made in the support system and, together with the appropriate safety harness system, installed in her automobile.

FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #18.

P-12
Any Etiology
Wheelchair Use
Hold-down

PROBLEM: Need wheelchair hold-down for passengers in vans
The problem was to locate a safe, easy-to-install, convenient tie-down for van passengers in wheelchairs.

Holding Aid

SOLUTION: Over-center clamps, seatbelt, floor reinforcement
The trucking industry uses over-center clamps for tying down loads on flat-bed trailers. These can be used by hooking two of them over the wheelchair frame and anchoring them by flush-mount anchor points. A seatbelt is also required and should be bolted to the floor. At all anchor points the steel floor of the van should be reinforced with a steel plate from underneath. The Braun Corporation, 1014 South Monticello, Winamac, IN 46996, sells a kit which includes the seatbelt but does not provide the reinforcing for the floor. The cost is approximately $100.00 for the kit.

FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #17.

P-13
Paraplegia with Quadriparesis
Loading Wheelchair in Car

PROBLEM: Inability to independently load a wheelchair into a car
A driver was too weak to load a wheelchair into the back seat of the car. He could transfer into the passenger seat of a large-size car and scoot over to the driver's seat, but muscle strength in the upper extremities and torso was too weak to pull the wheelchair into the car. He could also transfer to the driver's seat and pull it forward to reach the wheelchair but was too weak to pull the wheelchair into the car. When a miniwinch was hooked onto the wheelchair, the driver still lacked sufficient strength to turn the winch handle.

Lifting Aid

SOLUTION: Installation of a car-top wheelchair carrier
The driver transferred into the car without difficulty. He had sufficient strength to manage the toggle switch on a car-top carrier and fasten the straps to the wheelchair. He guided the wheelchair as it was lifted to keep it from hitting the car and was totally independent in loading the chair with this type of device (Mark VII Electromatic Top Loader). Cost information is available through The Wheelchair Carrier Corporation, P.O. Box 9328, Phoenix, AZ 85068.

FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #10.

P-14
Congenital Arm Deformity
Impaired Reach, Strength
Driving

PROBLEM: Inability to drive standard auto
A client with congenitally foreshortened arms (hands attached at elbows, approximately 6" from body) wishes to drive his own car. He has good finger dexterity but poor strength in arms.

Car Modification

SOLUTION: Modified steering column, gear shift
Local vendors of special vehicle control adaptations were identified. Suitable modifications were made to the steering column and gear shifter by Wright-Way, Inc. of Garland, TX. (The client was able to return to work.)

FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #16.

P-15
Quadriplegia
Limited Trunk Stability
Wheelchair Transfer

PROBLEM: Unstable transfers using commercial transfer boards
Conventional transfer boards (about 8" wide) were difficult for quadriplegic persons who have upper-body balance limitations. Some persons were resistant to work because of the perilous transfer from wheelchair to car and the difficulty of rising over the large rear wheel.

Mobility Aid

SOLUTION: Vacuum-formed "Fender" transfer board
A lightweight plastic transfer board was molded which provides full-width support and a gentle slope over the wheel. Some 400 units were sold by Fred Sammons, Inc., but production has been terminated.

FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #19.

P-16
Any Etiology
Wheelchair Use
Motorcycle Riding

PROBLEM: Inability to vacate wheelchair for cycling
Numerous wheelchair users would like to use a motorcycle for transportation and need to have their chairs with them when they arrive at their destination.

Motorcycle Modification

SOLUTION: TRY-CYCLING platform sidecar unit for motorcycle
By use of this commercially available platform sidecar unit, the person can avoid time- and energy-consuming transfers in and out of his chair that are

generally required when wishing to drive a car or van. By popping the front wheels up onto the platform and pulling one's self and chair onto the platform, the person can strap the chair to the platform with the tie-downs and is ready to take off. For those who cannot pop up the front wheels on their chair, a ramp is available at no cost. Available from TOMCO Enterprises, Inc., 7701 Hoover Road, Valley Center, KS 67147, (316-755-2269 or 264-8086) for $3,650.00. Price includes sidecar with fiberglass front fairing and new 400 cc Hondamatic motorcycle. Normal-to-near-normal strength and dexterity in hands and arms are required for safe operation.

FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #20.

W-87
Cerebral Palsy
Limited Hand Dexterity
Setting Rivets

PROBLEM: Difficulty grasping small objects
Hardware, including both the male and female portions of a rivet, must be assembled on a leather boot upper by a client with hand dexterity limited by spasms. The client has difficulty grasping the steel rivets and placing them accurately.

Dexterity Aid

SOLUTION: Magnet plus board with holes
Since the rivets being used are steel, a small hand tool was designed and fabricated that allowed the client to easily grasp the tool and pick up the rivets with a small magnet attached to the tool. To place the rivets in the proper orientation for pick-up, a board with holes was utilized. The rivets are poured onto the board and swept with the hand until the rivets fall into the holes in the proper orientation.

FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #1.

W-88
Deafness
Telephone Communication

PROBLEM: Difficulty communicating with co-workers and family
A large commercial bank agreed to hire and train a deaf individual to handle deaf customer calls and to interface with other deaf employees needing to communicate within the bank system. The employee chose to use the new job as an opportunity to live independently. A complete communication method involving her parents' home, her new apartment, and her place of employment was necessary.

Communication Aid

SOLUTION: TDDs supplied by telephone company
Consideration of the needs of the employer and the employee led the bank to choose a paper-tape printer type of telecommunication device for the deaf (TDD) offered by the telephone company on a monthly tariff. This portable device, a Porta-Printer manufactured by Krown Research, Inc., offers a permanent record of both incoming and outgoing conversations. The employee chose a portable TDD using a light-emitting diode (LED) message display manufactured by Micon Industries. This MCM/D is also a monthly tariff item from the telephone company.

The parents chose to use a Porta-Printer with the paper-tape record. The family concerns were solved, thus enabling the deaf individual to become independent and employed away from the home area. The employer enjoys the services of an employee with insight and qualifications not previously utilized in banking.

FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #2.

W-89
Quadriplegia
Telephone Dialing

PROBLEM: Inability to dial telephone
A bedridden quadriplegic wanting to expand a small real estate business needs a telephone system to enable him to communicate directly with his associates and customers.

Communication Aid

SOLUTION: Automatic dialer
The telephone company's handicapped centralized assistance point field representative determined the number and type of telephone calls involved. It was decided that a Teledialer 32® automatic dialer could handle the repetitive dialed numbers by pressing one button with a mouthstick. To give him complete independence a Speakerphone® was incorporated in the system to be controlled by using the mouthstick. These devices are standard tariffed offerings and only need be positioned for the individual to function independently.

FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #2.

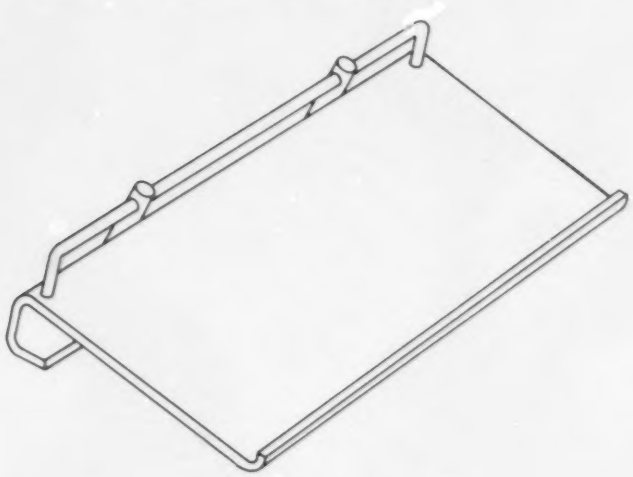
W-90
Impaired Coordination
Cerebral Palsy
Counseling

PROBLEM: Inability to hold charts open
A woman who works as a vocational counselor needed to display client charts and then view the contents. Her physical dysfunctions include paralysis involving chiefly the left side of the body (hemiplegia), involuntary and incoordinated muscular function of the right side (athethosis and ataxia), and difficulty in speech enunciation (dysarthria), all due to cerebral palsy. When turning pages, her lack of good hand control caused the chart to slide around. Once pages were turned, they would flip back. The difficult task of consulting a chart while talking to a client on the telephone caused her speech at times to be unintelligible. This was only one of several job tasks that she needed to perform with less difficulty to increase self-reliance and productivity.

Positioning Aid

SOLUTION: A display stand for record charts
A special reading stand was designed and constructed. This stand has a slanted surface with a lip at the lower edge to support a chart. At the top bar is a swinging lever which acts as a finger to hold down pages and prevent them, when turned, from springing back. Since the woman has better control of her head than of her hand, it was recommended that whenever possible, she use a mouthstick to turn pages.

FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #12.



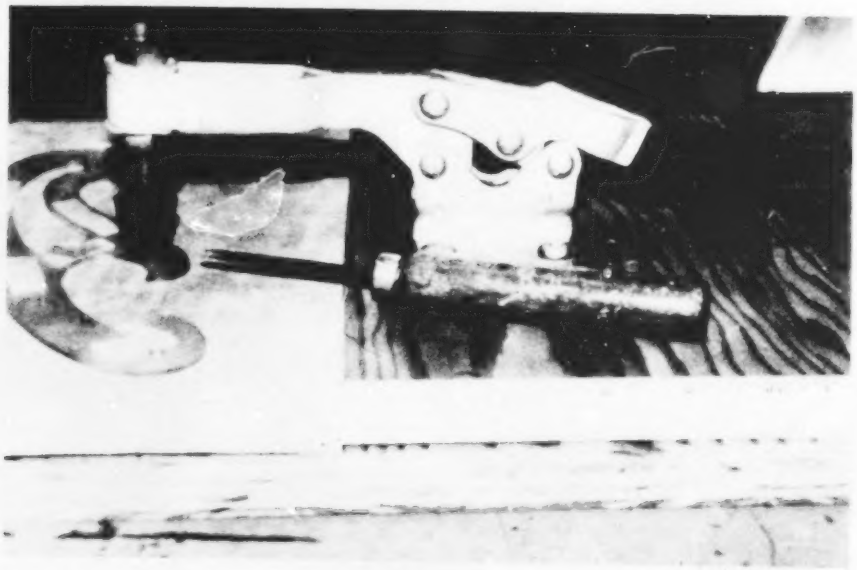
W-91
Cerebro-vascular Accident
Left (dominant) Hemiplegia
Template Making

PROBLEM: Inability to hold materials in template making
The client sustained a CVA with resultant left hemiplegia (dominant side). He had previously worked as a template maker in a prototype shop and desired to continue in that work. Pattern making requires the use of both upper extremities in handling patterns and scribes. How can this job be performed by a person with the use of only one extremity?

Holding Aid

SOLUTION: Toggle clamp holding device
A toggle clamp was mounted to a piece of 3/4" plywood cut to the appropriate size. The particular pattern was then placed on top of the raw material and secured into place by the clamp. The client was then able to scribe the pattern in an acceptable manner.

FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #5.



W-92
Polio
Dominant Arm Paralysis
Engraving

PROBLEM: Inability to operate engraving machine

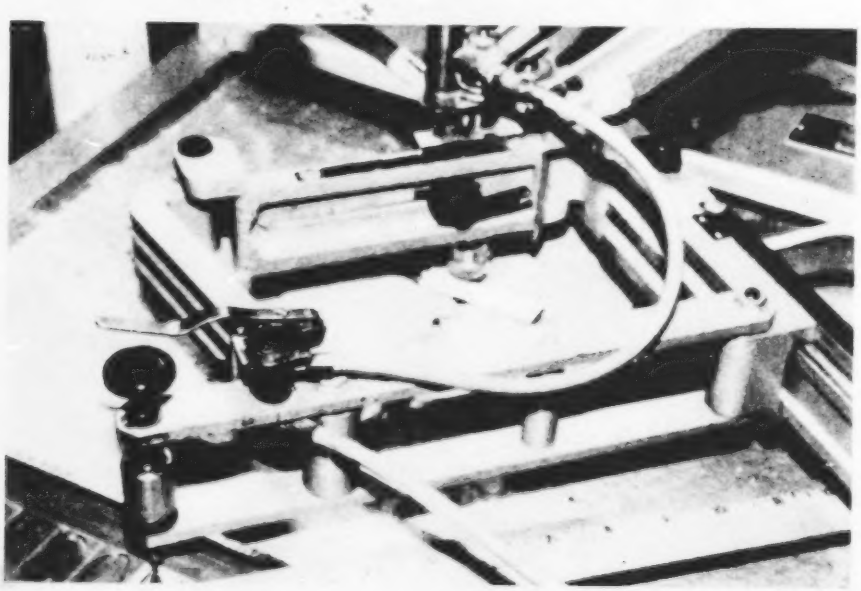
The client contracted poliomyelitis resulting in total paralysis of the dominant upper extremity. He subsequently received a severe shoulder injury on the nondominant side, rendering the upper left shoulder only partially functional.

This client was interested in becoming an engraver. Engraving normally requires the use of both upper extremities. How can this work be done by a person with the partial use of only one arm?

Work Site Modification

SOLUTION: Pneumatic attachment plus control valve relocation

An engraving machine was fitted with a commercially available pneumatic air attachment. The control valve was mounted in close proximity to the stylus control knob enabling the client to operate both the stylus and the conventional cutter control lever with one hand with a minimum of shoulder movement.



FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #5.

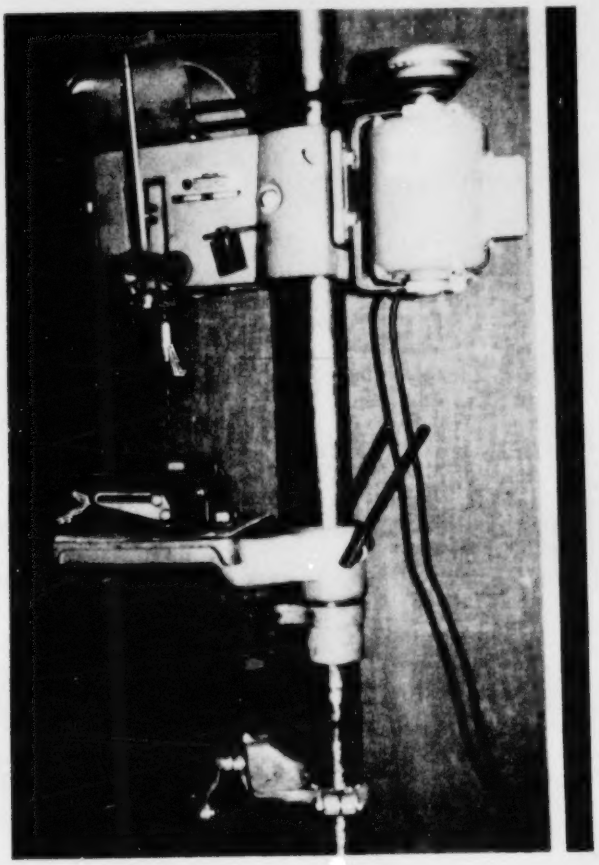
W-93
Cerebro-vascular Accident
Hemiplegia, Nondominant Side
Drill Press Operation

Jig/Fixture

PROBLEM: Inability to raise and lower drill press table
The client sustained a CVA with residual hemiplegia to the left non-dominant side. He had worked in the machine trade as a drill press operator. This job usually requires the use of both upper extremities in raising and lowering the drill press table. How can this task be performed by a person with the use of only one arm?

SOLUTION: Commercial cranking mechanism
A commercially available device permitting the table to be cranked up and down was attached to a standard floor model drill press stand. A support collar fits underneath the table support into which is fitted a threaded rod. This rod is attached to a cranking mechanism below the table which, when actuated, raises or lowers the table.

FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #5.



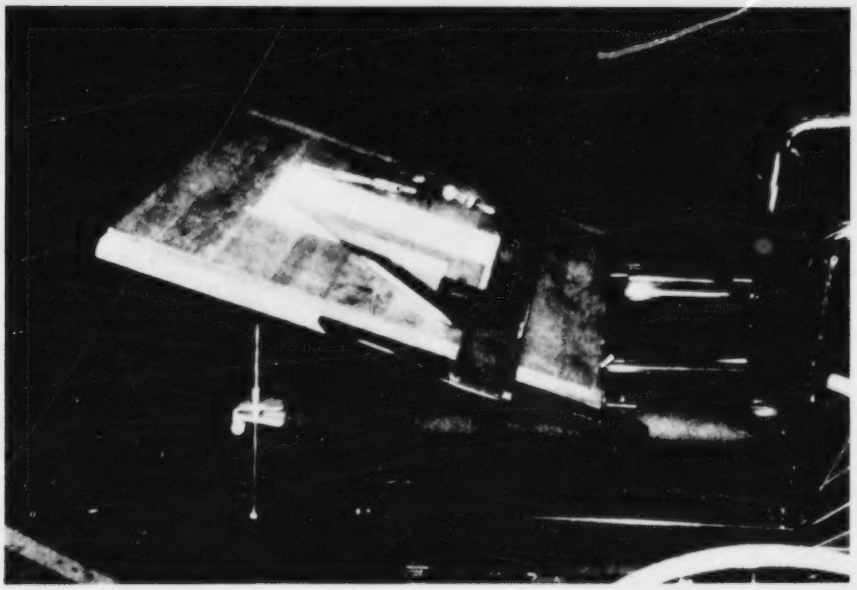
W-94
Polio
Impaired U.E. Function and Wheelchair Use
Drafting

PROBLEM: Inability to use drafting table
The client is a full-time wheelchair user, as a result of poliomyelitis, with all four extremities involved. He desires to become a drafter, however, he is incapacitated in terms of upper extremity range of motion, prolonged shoulder extension, and he cannot transfer independently from his wheelchair. How can drafting work be done from a wheelchair with these physical problems?

Positioning Aid

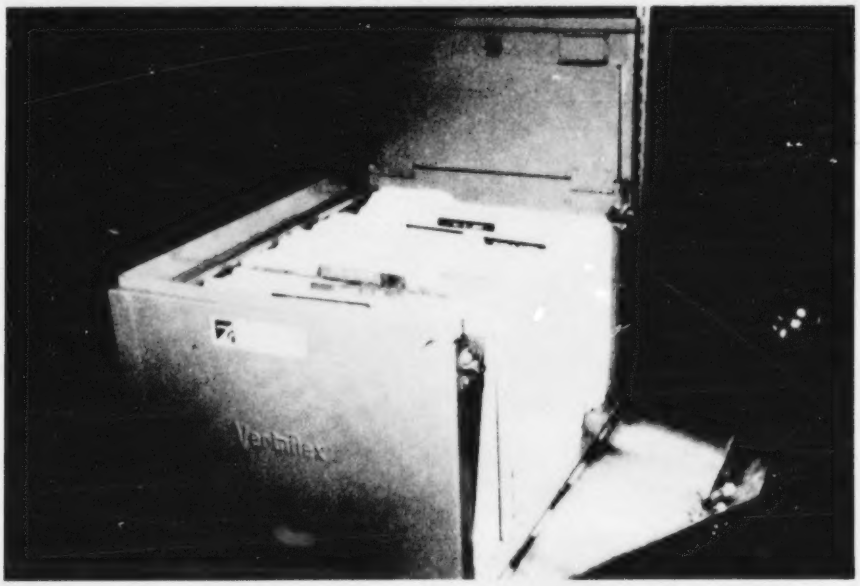
SOLUTION: Clip-on drafting board for wheelchair
A special device was fabricated to clip onto the arms of his wheelchair. This device (in two units) has an adaptive feature in the form of an adjustable mechanism permitting the raising and lowering of a standard drafting board to the desired work angle.

FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #5.



W-95
Juvenile Arthritis
Impaired Reach
Filing

PROBLEM: Inability to file and retrieve materials
The client is a victim of juvenile arthritis with severe upper extremity involvement precluding good range of motion and grasp, and is a full-time wheelchair user. She is interested in doing office work. The problem was



centered around her inability to file and retrieve material from filing cabinets in a conventional manner due to restricted range of motion.

Work Site Modification

SOLUTION: File drawer modification
One entire side section was removed from a portable horizontal-type filing case. This section was then hinged, permitting it to open out and downward exposing the filed material from the side. This permitted her to file and retrieve material from the side as her reach and lack of sufficient strength prohibited her from working from the top of the case. The section was fitted with two barrel bolts for ease in closing.

FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #5.

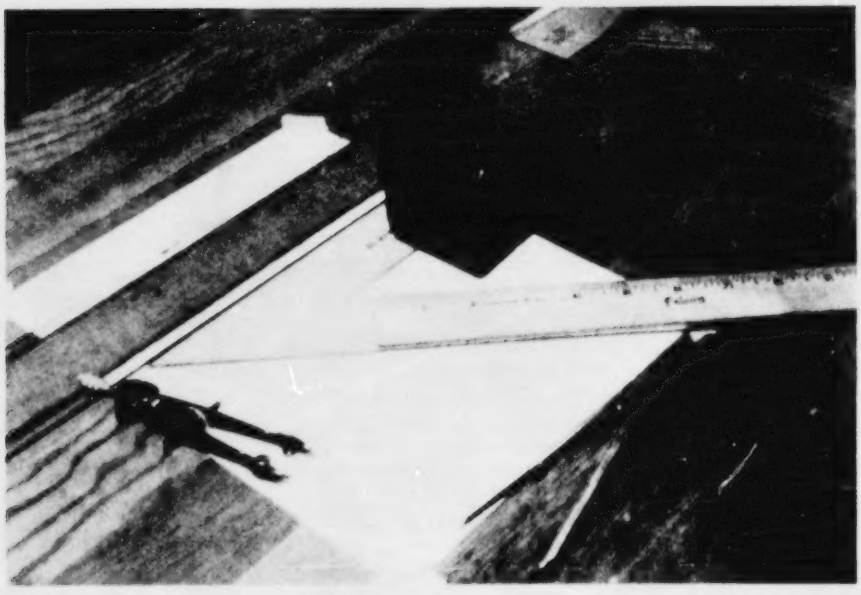
W-96
Brachial Plexus Injury
Nondominant U.E. Impairment
Drafting

PROBLEM: Inability to securely position drafting materials
The client has sustained a brachial plexus injury to the nondominant side. His aspiration was to become a drafter. This occupation would usually require the use of both upper extremities, because secured holding is required. How can this work be performed by a person with the use of only one arm?

Holding Aid

SOLUTION: Non-slip weight
A special weight was fabricated from two pieces of three-inch angle iron welded together to form a square. A piece of foam rubber was glued to the bottom to prevent slipping. This device enabled the user to hold his drafting tools such as angles and templates in place while drawing.

FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #5.



W-97
Juvenile Arthritis
Impaired Reach
Desk Work

PROBLEM: Inability to open desk drawers
The client is a victim of juvenile arthritis with severe upper extremity involvement precluding good range of motion and grasp. She is a full-time wheelchair user and is unable to transfer independently. She is interested in

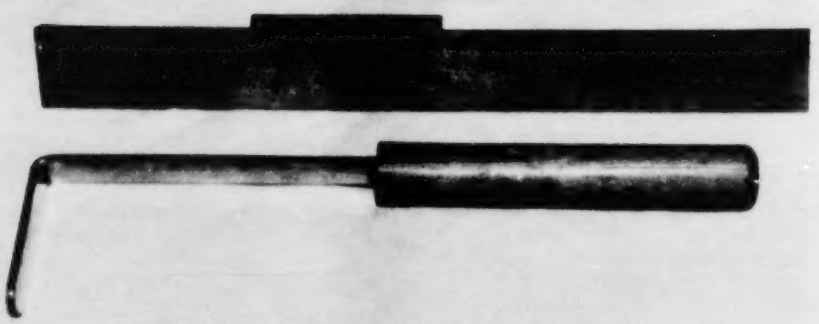
becoming an office clerk. The problem encountered was the inability to open desk drawers due to inadequate reach.

Dexterity Aid

SOLUTION: Reaching hook
A special hook was made from a piece of flat steel 1/2" × 9". Two inches of the flat steel was bent to a 90° angle. This was wedged into the end of a piece of 1" dowel stock, 6" in length, and secured by epoxy glue.

This device, 11" in length, permitted the client to open and close drawers easily from her wheelchair.

FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #5.



W-98
Brachial Plexus Injury
Nondominant U.E. Impairment
Using Socket Wrench

PROBLEM: Inability to remove sockets from wrenches using one hand
The client sustained a brachial plexus injury to the nondominant side, rendering the upper extremity nonfunctional vocationally. He desired to return to work as an auto mechanic in some capacity. One problem encountered was the inability to remove a socket from a wrench, in that this work requires constant changing of socket sizes. How can this task be handled quickly by a person with the use of only one arm?

Jig/Fixture

SOLUTION: Wrench holder
A special holder was constructed to hold the wrench in an upright position for easy removal of the socket. It is made from two wooden blocks, one fastened to the other. A 3/4" hole was drilled down the center of the upright portion to position the wrench handle. The bottom portion (6" × 4" × 1½") is used to clamp the device to the work bench. This device permitted the client to change sockets quickly.

FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #5.

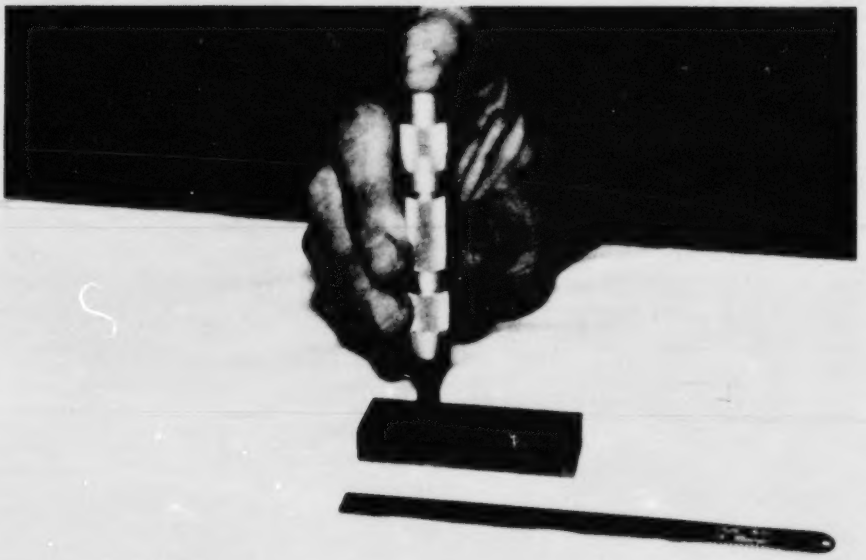
W-99
Cerebro-vascular Accident
Right (dominant) Hemiplegia
Center Punch Operation

PROBLEM: Inability to operate ordinary center punch with one hand (dominant side)
The client has worked many years as a machinist, and desires to return to some phase of the machine industry. In the process of many machine shop tasks it becomes necessary to use a center punch prior to drilling holes in the raw material of custom work. Ordinarily this task requires two hands, as a hammer is needed to strike the punch. How can this task be performed by a person with the use of only one functional upper extremity?

Modified Tool

SOLUTION: One-handed center punch
A commercially available one-handed center punch was provided to the client. It is spring loaded and has several tension settings to regulate the depth of impression in the material. Through the use of this device, the client was able to master another of the many difficult tasks confronted by one-handed workers. This is widely available from hardware stores and tool suppliers. Its cost is approximately $9.00.

FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #5.

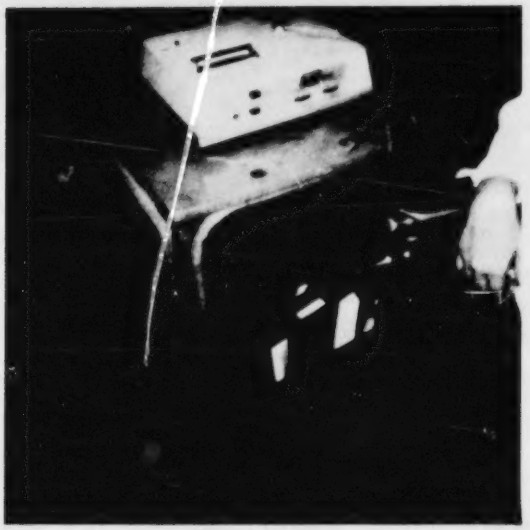


W-100
Cerebro-vascular Accident
Hemiplegia
Recording

PROBLEM: Inability to reach and operate dictating equipment
The client sustained a CVA with resultant hemiplegia. Her aspiration was to become a recording secretary. This occupation would usually require the use of both upper extremities in manipulating dictating equipment. How can this work be performed by a person who is confined to a wheelchair with the use of only one arm and the partial use of one leg?

Positioning Aid

SOLUTION: Control mounted on wheelchair
A dictating machine was placed on a small table near the client. Instead of the conventional foot control used from the floor, this device was specially mounted on the side of her wheelchair and near her knee by special spring clips which were fastened to the device by screws. This enabled her to start and stop the unit by merely adducting the partially involved lower extremity.



FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #5.

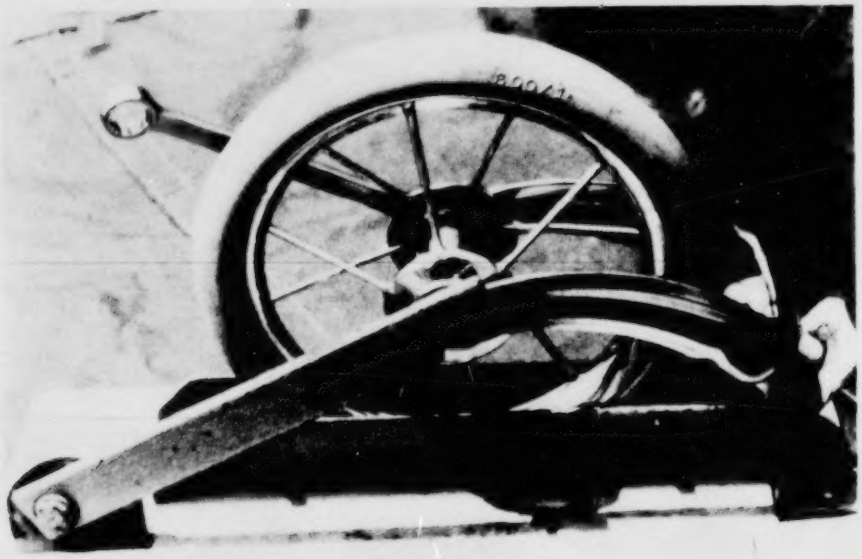
W-101
Cerebro-vascular Accident
Hemiplegia
Wheel Removal

PROBLEM: Inability to use both hands for removing wheel bearings
The client sustained a CVA with resultant hemiplegia of the dominant side. During the course of his rehabilitation, he was exposed to a variety of mechanical tasks among which was to separate the fork from the axle on the front wheels of the chair. This job would usually require the use of both hands in removing the nuts and bolts. How can this job be performed by a person with the use of only one hand?

Jig/Fixture

SOLUTION: Cradle and locking mechanism
A device in the form of a cradle and locking mechanism was devised whereby the front wheel is fastened into the cradle and secured by two bolts with wing nuts. To the side is a metal bar with a notch cut in one end to fit the nut and mounted in precise alignment with the nut. The bar drops down over the nut preventing it from turning. A boxend wrench is then used to remove the nut from the other side of the axle. In so doing, the client is able to remove the bearings from the wheel.

FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #5.



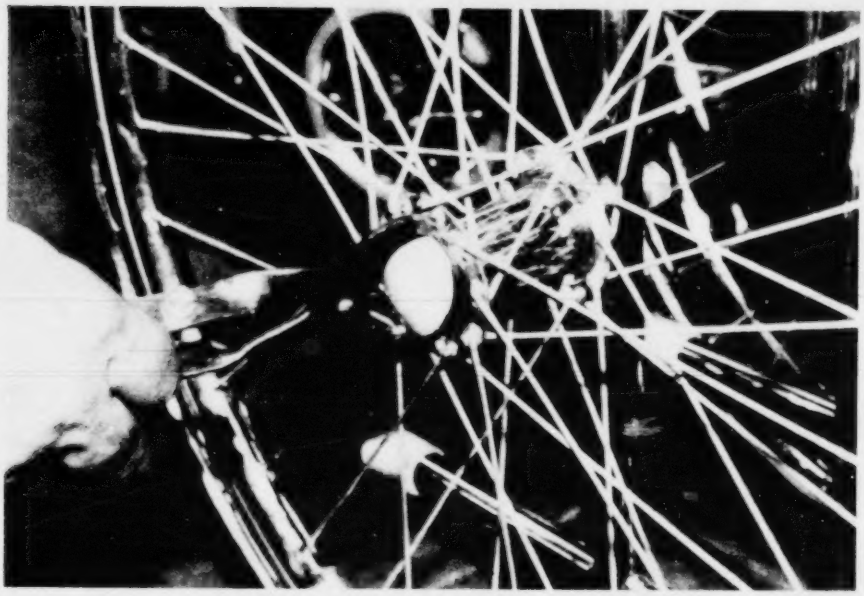
W-102
Any Etiology
Absent/Paralyzed U.E.
Wheelchair Repair

PROBLEM: Inability to remove hubcaps from wheelchair
Wheelchair repairers with an absent or paralyzed upper extremity have difficulty removing hubcaps with one hand.

Tool Modification

SOLUTION: Fabricated pliers-like pincers
A special pliers-like device was developed for removing hubcaps. This device has pincer-like tongs instead of jaws, enabling a more secure grasp on the caps. A hole was drilled in the handle and fitted with an 8/32 machine screw and nut to regulate the opening of the jaws for different variations of hubcaps. With it, this became another of the many varied tasks of wheelchair repair that can be handled easily by workers with the use of only one arm and hand.

FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #5.

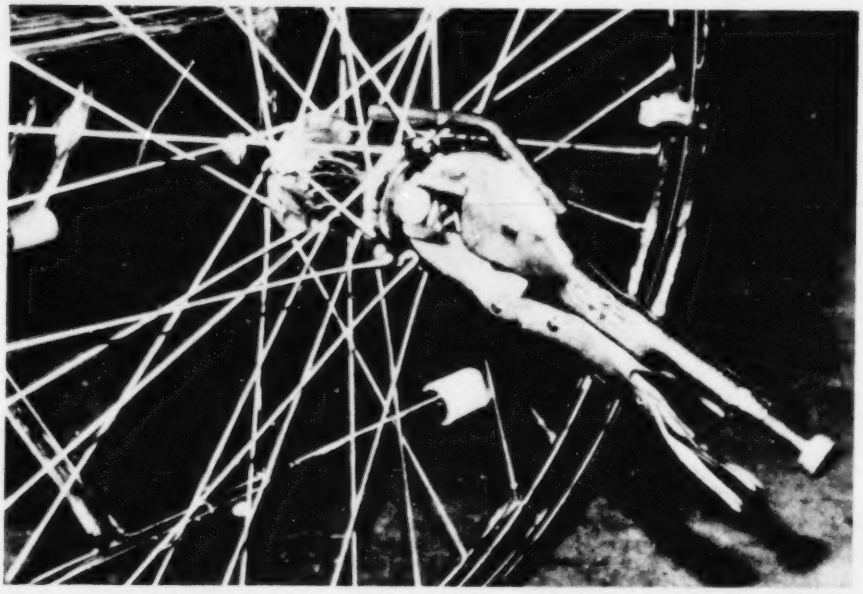


W-103
Any Etiology
Absent/Paralyzed U.E.
Wheelchair Repair

Tool Modification

PROBLEM: Inability to remove wheels from wheelchair
Wheelchair repairers with an absent or paralyzed upper extremity have difficulty removing wheelchair side wheels with one hand.

SOLUTION: Modified vice-grip pliers
Instead of laboriously removing the axle bolt (fine thread) from the wheel using an open or boxend wrench, a piece of 3/8" steel rod 5" long, and bent



approximately 40°, was welded to a pair of 10" vise-grip pliers. The pliers are then clamped to the head of the bolt, and with the rod protruding through the spokes of the wheel, the entire wheel is simply spun off the wheelchair frame in an expedient manner.

FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #5.

W-104
Any Etiology
Absent/Paralyzed U.E.
Wheelchair Repair

Jig/Fixture

PROBLEM: Difficulty washing wheel
Wheelchair repairers with an absent or paralyzed upper extremity have difficulty washing wheelchair side wheels with one hand.

SOLUTION: Holding trough
A holding trough was fabricated from 26-gage sheet metal and attached to a washing tank. This trough, 25½" in length, is so formed that the tire rim will fit snugly, while the hand rim and a section of the spokes are immersed in the washing solution. The wheel is turned and automatically held securely in position while washing, permitting the entire operation to be performed with one hand.

FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #5.

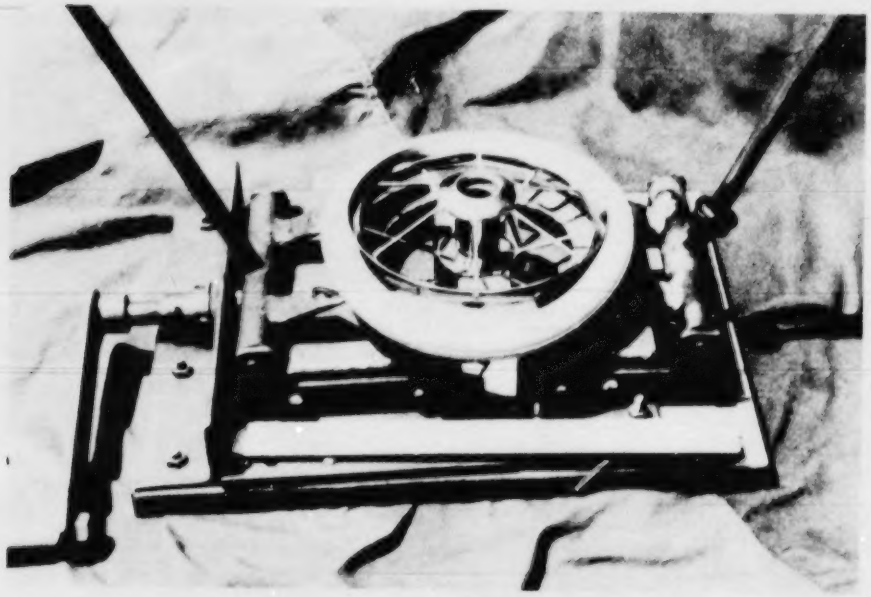
W-105
Any Etiology
Absent/Paralyzed U.E.
Wheelchair Repair

Jig/Fixture

PROBLEM: Difficulty replacing wheelchair casters
Wheelchair repairers with an absent or paralyzed upper extremity have difficulty replacing 8" wheelchair solid rubber caster tires with one hand.

SOLUTION: Movable mandrel with cranking attachment
A special movable mandrel with a cranking attachment was constructed so that when the tire is placed over four hooks which are welded to two pieces of steel pipe, and the crank is actuated, the tire will stretch sufficiently to fit over the rim of the wheel. This entire operation can be performed with one hand.

FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #5.



W-106
Bilateral Shoulder Disarticulation
Absence of U.E.'s
Note Taking

Dexterity Aid

PROBLEM: Inability to take notes
A man with bilateral shoulder disarticulation was attending community college and needed to take notes there, and also as part of the interviewing function of his job. He was unable to perform these functions due to the lack of upper extremities.

SOLUTION: Tape recorder to be operable by a chin switch
The portable tape recorder was attached to a camera shoulder strap so that the tape recorder could be worn over the shoulder. A microphone was then mounted on the shoulder strap at a position close to the individual's mouth. The switch was, in turn, mounted at a place on the strap where it could easily be operated by the individual's chin. He is now able to take notes while away from his desk and then, by means of auxiliary instruments at his work setting, he can play back his notes for review.

FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #6.

W-107
Spinal Cord Injury
Quadriplegia
Soldering

Tool Modification

PROBLEM: Inability to operate standard soldering equipment
An individual with low-level quadriplegia was seeking employment as a solder touch-up assembly person at an electronic assembly factory. He was not able to operate the standard hand-operated solder suction devices to redistribute molten solder on a circuit board. Also, because of weakness in his hands, he was not able to operate standard cutting pliers to snip circuit board wires.

SOLUTION: Modified cutters and suction device
Extend handles on existing cutters to increase leverage and simultaneously attach chain to end of extended plier handles to limit opening for easy grasping. To allow him to manipulate molten solder, a vacuum pump was modified to be used in conjunction with a teflon suction tip to draw the solder in the desired direction. The suction tip was made so that it could easily be grasped with limited hand function.

FOR FURTHEP INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #6.

W-108
Any Etiology
Quadriplegia
Reviewing Computer Printouts

PROBLEM: Difficulty handling computer printouts
Students or workers with quadriplegia have difficulty reviewing voluminous stacks of computer printouts because use of wheelchairs combined with their arm weakness impede paper handling.

Dexterity Aid

SOLUTION: Fabrication of microprocessor-based paper handler
A microprocessor-based paper handler was designed and fabricated that electrically advances or reverses computer paper by switch operation. Features included memory location, two-speed forward and reverse indexing, and self-stacking capability. All the controls were made accessible by positioning a keyboard that was mounted on a goose-neck. With the use of this equipment, an individual need only press the appropriate button on the keyboard with a mouthstick to review typed copy on computer paper.

FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #6.

W-109
Heavy Metals Poisoning
Blindness
Reading

PROBLEM: Inability to read on the job
An atmospheric physicist who has been blind since age 16 as a result of heavy metals poisoning encountered problems in getting job-related reading accomplished. Although he generally took such material home for his wife to read to him in the evening, he realized he was not getting the most out of his reading because of the delay in timing and the tendency to scan for highlights rather than to read thoroughly.

Sensory Aid

SOLUTION: Reading Machine
The Kurzweil Reading Machine is a computerized system consisting of three components: an omni-font character recognition camera mounted on an automatic tracking device housed beneath a glass surface, a mini-computer which converts the printed or typewritten material scanned by the camera into full synthetic speech output, and a small operating terminal. Virtually any books, magazines, letters, reports, or memoranda can be read at rates up to 250 words per minute. The machine reads directly in real time using a specially written program contained on a small cassette.

A separate program converts the system into a powerful talking calculator, with display of up to fifteen characters. It can perform basic arithmetic as well as scientific and exponential functions. A special command converts the machine into a talking terminal when interfaced with appropriate computers or data bases. In this instance, the machine is configured with a UNIVAC 1108 computer and is used as a text editing and word processing device. Any material in the stored program can be repeated or recalled and errors corrected.

Since the physicist has slight residual vision, he has also connected the reading machine to a Tektronix 4016-1 computer terminal which can enlarge a single character up to 16" high; however, he usually uses a 1" enlargement to get a reasonable amount of the spoken material displayed on the screen. The Reading Machine was designed by and is manufactured and distributed by Kurzweil Computer Products, Inc., 33 Cambridge Parkway, Cambridge, MA 02142, (617) 864-4700. Please inquire directly for additional information.

FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #11.

W-110
Blindness
Computer Access

PROBLEM: Need to access remote computers
A blind statistician needs to organize and publish data contained in a computer data base. He also needs to be able to write programs for data analysis and to format the results in a form that can be directly printed.

Sensory Aid

SOLUTION: The M.I.T. Braillemboss
A braille page printer developed at M.I.T. was connected with a standard computer terminal, providing a braille copy of the programmer/computer dialogue essentially identical to the inkprint output provided for sighted users. With this sytem, the statistician publishes monthly reports and, on request, extracts specialized data for planning and negotiation. Commercial braillers are available from Triformation Systems, Inc., 3132 Southeast Jay Street, Stuart, FL 33494 and from SAGEM (Societé d'Applications Générales d'Electricité et de Mécanique), 6 Avenue D'lena, 7583 Paris, France.

FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #13.

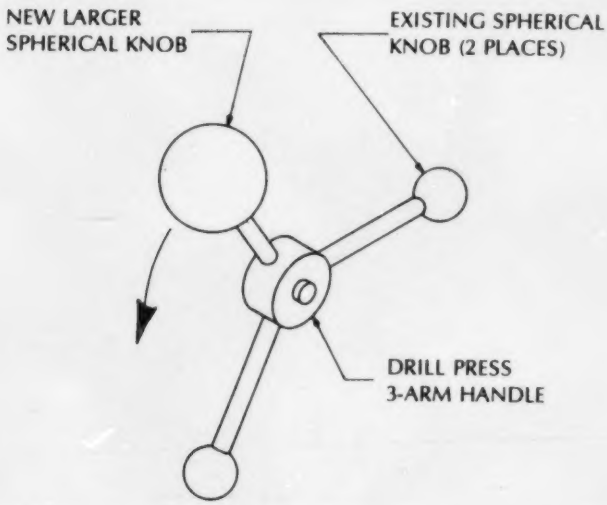
W-111
Cerebral Palsy
Poor Grasp
Drill Press Operation

PROBLEM: Inability to grasp small handle
A man mildly affected by cerebral palsy had all the capabilities required to operate a drill press except that he was unable to grasp the standard spherical handle firmly.

Dexterity Aid

SOLUTION: Enlarged grasping surface
A much larger ball handle was formed on a lathe and threaded to fit the handle shaft. This was substituted for the standard, much smaller handle.

FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #14.



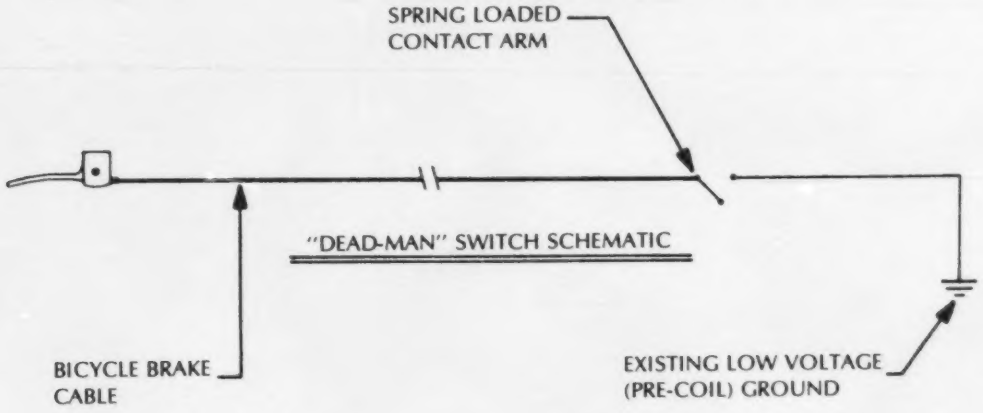
NOTE: ONLY ONE OF THE THREE KNOBS WERE REPLACED BECAUSE WORKER COULD MOVE THE DRILL AN ADEQUATE AMOUNT BY GRASPING ONE KNOB.

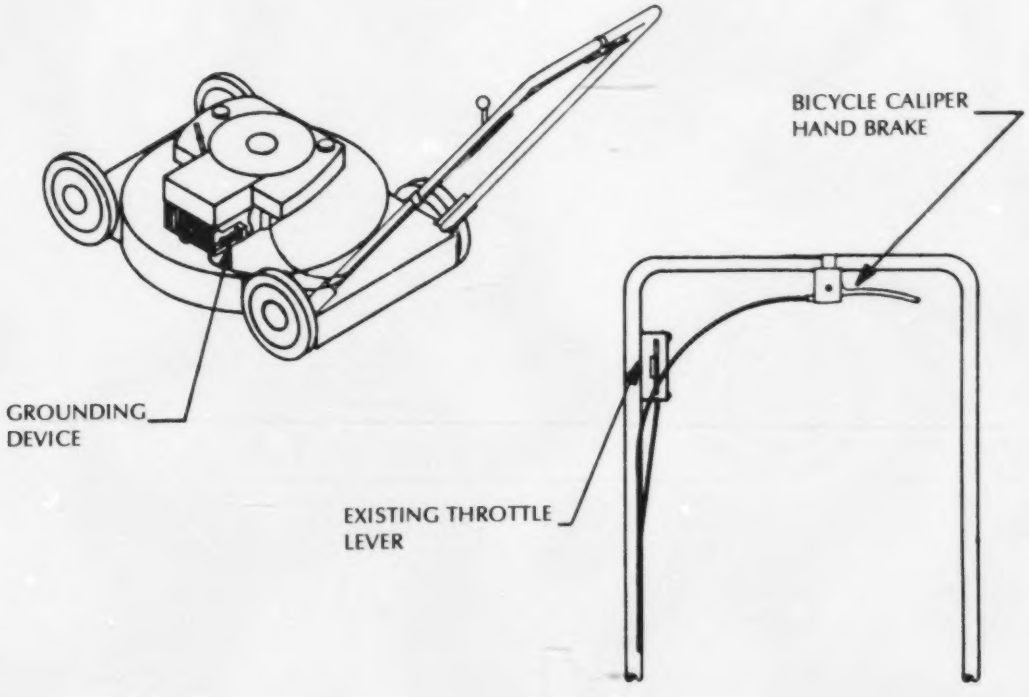
W-112
Cerebral Palsy
Ambulatory Quadriplegia
Lawn Mowing

Safety Device

PROBLEM: Inability to use power mower safely
A man with cerebral palsy was employed as a grounds maintenance person. Although ambulatory, his employer did not feel he could operate a power lawn mower safely.

SOLUTION: "Dead man" switch
A bicycle hand brake which actuates a "dead man" switch was installed on the handle of the mower. The mower runs only when the hand brake switch is held closed.





"DEAD-MAN" SWITCH

FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #14.

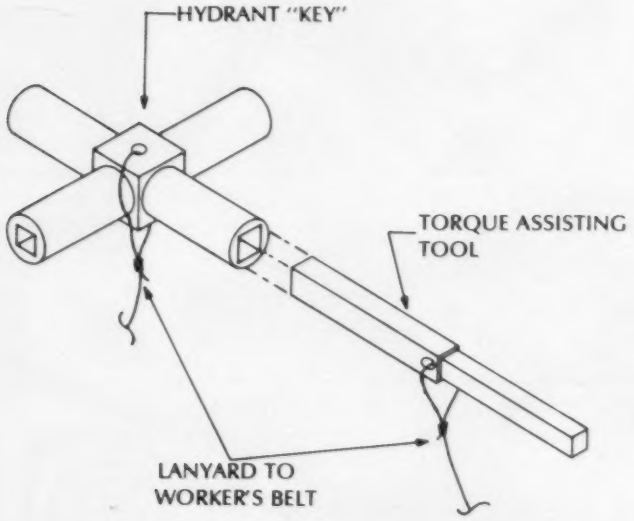
W-113
Cerebral Palsy
Ambulatory Quadriplegia
Grounds Maintenance

PROBLEM: Inability to operate valve
A man with cerebral palsy was employed as a grounds maintenance person. Although ambulatory, he could not actuate the outside water faucets which had square shafts rather than handles.

Dexterity Aid

SOLUTION: Increased leverage
A "cheater bar" tool was designed to increase the leverage which can be applied to the valve.

FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #14.



W-114
Post-polio
Quadriplegia
Fishing Boat Operation

PROBLEM: Inability to operate fifty-foot fishing vessel
A post-polio, quadriplegic, mid-30s male and his wife (able-bodied) were involved in a self-employment commercial fishing venture. With only minimal right hand and left foot function, he was unable to independently control and operate the fishing vessel; therefore, a partner was necessary. This reduced profits below an acceptable level.

Mobility Aid

SOLUTION: Control system, seating system
A seating system was developed using a Recaro LS model seat with adjustable seat back, head support, trunk bolsters, and thigh bolsters to provide a stable base. The seat was attached to a power elevating (24") and rotating (270°) base to attain the necessary visual range. It was custom constructed by Advanced Mobility, Los Angeles, CA, (213) 782-0200, utilizing components similar to power seats in modified vans. A custom mounting bracket was installed for the Recaro seat, footrests, and control panel. Below eyeline view, mirrors from Sears were mounted to the vessel exterior to improve visual range.

A control panel was designed and fitted to the seat system and folded away during transfers. The control panel consisted of a modified w/c joystick (four position) for the power seat control, an electric throttle control with actuator slave (Naud Industries, Seattle, WA) and lever extensions, an automatic pilot with steering controls (Metal Marine Pilot, Inc.), and lever

extension, and an on/off toggle switch for the foot-controlled clutch. The electric clutch for the hydraulic gears (Naud Industries) was mounted on the footrest near the left extremity. A rotating cylindrical switch (Forward-Neutral-Reverse-Neutral-Forward-Neutral-Reverse) was interfaced with the commercially available electric clutch.

The fishing vessel modification was successful and provided economic independence for the couple. This case clearly shows the need to utilize existing resources and products especially in complicated problems. The cost included rehabilitation engineer staff time (80-100 hours) plus $4,000.00 in commercially available products and subcontracted labor.

FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #15.

W-115
Paraplegia
Hairdressing

PROBLEM: Inadequate reach
Confined to a wheelchair, a paraplegic individual was trained as a cosmetologist prior to her injury. She had difficulty performing her job because she is unable to comfortably reach a customer's head to cut hair and give hair treatments.

Mobility Aid

SOLUTION: Stand-up wheelchair
Rather than modifying the customer chair, a wheelchair with an elevating seat feature was recommended. Following a demonstration of several products, the LEVO was selected. It is a manual wheelchair with a power-lifting feature that enables an individual to attain a standing position. The LEVO is available through American Stairguide distribution for approximately $3,100.00.

FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #16.

W-116
Blind
Typing

PROBLEM: Inability to proofread
A blind typist needed a device that would enable her to proofread her work and correct errors independently.

Sensory Aid

SOLUTION: Talking Typewriter
An IBM Talking Typewriter was acquired for the individual, who will be working in collaboration with a private organization to determine the efficacy of this equipment. This Audio Typing Unit has electronic speech capabilities so that the typist is able to hear individual words spelled or an entire text read line by line including machine verbalization of punctuation. The current purchase cost of the system is approximately $5,500.00.

FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #16.

W-117
Spinal Cord Injury
Paraplegia
Welding

PROBLEM: Safety, feasibility of welding job
Prior to his injury, a paraplegic individual was employed as a pipeline construction welder. He has good control and strength in his upper trunk and extremities and wishes to pursue a shop job involving heliarc welding.

Work Site Modification

SOLUTION: Shields, altered controls
It was determined that shields which will prevent burns can be acquired or easily fabricated. Specific heliarc torches which incorporate all controls are commercially available. A height-adjustable worktable can be acquired from several sources, including J. A. Preston Corporation, 71 Fifth Avenue, New York, NY 10003. The foot-pedal control associated with heliarc welding can be replaced by a hand control for about $100.00. Heliarc welding yields no

slag, therefore the danger of burning a client who has no lower-limb sensation is minimal.

FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #16.

W-118
Spinal Cord Injury
Paraplegia
Bench Work

PROBLEM: Inability to position self adequately for bench work
A paraplegic individual who uses a manual wheelchair is receiving on-the-job training as a camera and projector repairman. The individual is unable to conveniently reach the workbench surface and assume the position of looking down into the items to be repaired.

Positioning Aid

SOLUTION: Stand-up wheelchair
Because several workers use the workbench, height modification was inappropriate. Some wheelchairs with an elevating seat capability were demonstrated. The LEVO Stand-Up Wheelchair was used on a trial basis by the client at the worksite and was eventually purchased. The wheelchair allowed the worker to attain a convenient and comfortable height for repair of the equipment.

FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #16.

W-119
Above-knee Amputation, Left
Truck Driving

PROBLEM: Inability to operate truck clutch
The individual has an above-knee amputation on the left side. Prior to an industrial injury the individual owned and operated a ten-speed logging truck. Since he refuses to wear a prosthesis, he is unable to operate the truck's clutch and return to his job.

Vehicle Modification

SOLUTION: Hand control for clutch
Grasham Driving Aids, 308 Wixom Road, Wixom, MI 48096, agreed to send the client a hand control to operate the truck clutch. Following a trial period, the hand control was purchased for the client at an approximate cost of $100.00.

FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #16.

W-120
Low Vision
Computer Programming

PROBLEM: Inability to read small characters
A low-vision individual is employed as a computer programmer trainee. He has difficulty reading characters on the computer screen display and needs characters to appear nearly twice the usual size.

Sensory Aid

SOLUTION: CRT Viewing System
Following trials with a screen-mounted fresnel lens for magnification, a Visualtek Cathode Ray Tube Viewing System was purchased for the client. The system's camera and lens are mounted on a movable platform that enables the user to scan a computer screen and adjust magnification (4× to 20×), brightness, and contrast. The system is available from Visualtek, 1610 26th Street, Santa Monica, CA 90404.

FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #16.

W-121
Low Vision
Mild Retardation
Hyperactivity
Addressograph Operation

PROBLEM: Inadvertent activation of addressograph
An individual with low vision operates an addressograph machine (Elliott 880) with a foot switch. Because of hyperactivity, the client makes many random movements causing inadvertent activation of the machine. This causes ink to be deposited on a drive cam which subsequently soils envelopes. Inadvertent activation of the machine is also a safety hazard for the client's fingers and hands.

Dexterity Aid

SOLUTION: Safety switches
A pair of push-button switches were installed on the table of the addressograph machine near the paper guide to be used in series with the foot switch. With this switch arrangement, it is necessary to depress both buttons simultaneously before the foot switch can activate the machine. This modification prevented ninety-five percent of the inadvertent triggers and substantially improved the client's safety.

FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #16.

W-122
Cerebral Palsy
Arthritis
Typing

PROBLEM: Difficulty in typing
Typing assistance was required by an individual who suffered severe cerebral palsy and very painful arthritis. She could utilize head and neck movement only. She had been using her nose to type which was very uncomfortable and time consuming. She partially supports herself by writing poems and articles.

Dexterity Aid

SOLUTION: Headstick
A suitable headstick, the Enabler available from Adaptive Therapeutic Systems, Madison, CT 06443, was recommended. This increased her speed significantly and made the client much more comfortable. (A continuous paper roller, which can be installed on the typewriter, was also recommended since the client cannot change paper herself. The paper roller is available from any IBM sales office.)

FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #16.

W-123
Traumatic Injury
Blind
Woodworking

PROBLEM: Slowness, safety hazards
Trained in woodworking prior to a gunshot injury, a blind individual works in a shop where he builds crates used for chemical valve shipments. The client cuts boards and plywood to predetermined sizes for assembly using table, radial arm, and panel saws. He does a small amount of assembly work with pneumatic nail and staple guns. The client is able to do the work, but the saws and pneumatic hammer presented safety hazards. His assembly work was slowed by his inability to see the work.

Jigs/Fixtures

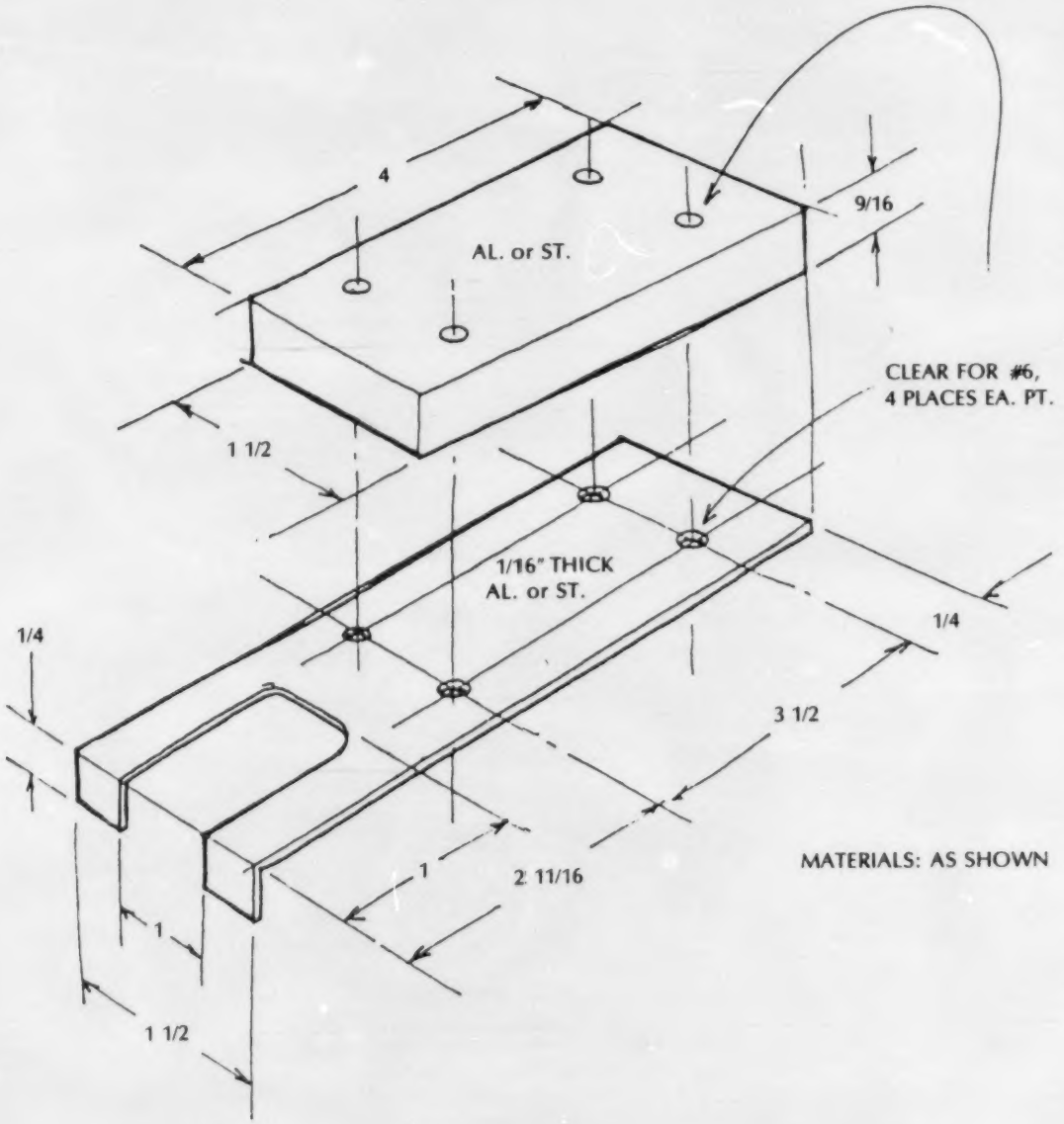
SOLUTION: Guard, jig, guide
Several companies that manufacture guards and guides for power tools were consulted. None were found to be appropriate for this application. Southwest Research Institute, working with the IMPART Program, designed and fabricated the following items:

1. Blade Guard for Table Saw On Close Observation
It was discovered that the pieces being cut on the table saw were always 3/4" thick or slightly less. Because of the size of the client's hands, it was decided that a fixed blade shroud (guard) with just over 3/4" clearance to the table top would eliminate the possibility of getting his fingers within reach of the blade. Using available wood materials, the existing swing-up blade guard was replaced with a fixed shroud.

2. Assembly Jig for Plywood Boxes
Also using available materials, a framework was built which exactly fit the inside of the box to be built. Using the jig, the client was able to preassemble all of the sides and bottom loosely, then fasten the box together with the staple gun. That considerably reduced the holding requirement and allowed him to more accurately align the gun with its target. On the first trial, he cut his assembly time in half.

3. Positioning Guide for Pneumatic Stapler
A guide attached to the pneumatic stapler tip to enhance accurate positioning and alignment of the staple gun was recommended.

FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #16.



W-124
Cerebro-vascular Accident
Hemiplegia
Barbering

Dexterity Aid

PROBLEM: Inability to hold comb
Following a cerebrovascular accident, an individual has maintained his ability to lift and move his afflicted left upper extremity, but the grasping ability in his hand is limited. He wants to return to his occupation of barbering but needs a method or device for securely holding a comb.

SOLUTION: Large-handled combs
The client was unable to hold a comb of small size; however, he could grasp and hold a larger object. A selection of large-handled combs was acquired. Large handle grips are available from Maddak Inc., Requannock, NJ 07440.

FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #16.

W-125
Congenitally Nonverbal
Building Maintenance

Holding Control

PROBLEM: Difficulty carrying speech aid
A nonverbal individual is not otherwise physically handicapped. Working as a building maintenance person, he uses a Handivoice model 120 to communicate. A method or means is required which will allow him to easily carry the device and use it while he works.

SOLUTION: Backpack plus remote control
IMPART, working cooperatively with Southwest Research Institute, recommended that the communication aid be placed in a backpack for ease of portability, freeing the individual's hands. A 3½" × 4" remote keyboard, having the same code input capabilities as the keyboard on the device itself, was connected by umbilicus to the Handivoice unit and mounted on the individual's belt for convenience.

FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #16.

W-126
Multiple Sclerosis
Quadriparesis
Wheelchair Loading

Communications Aid

PROBLEM: Inability to lift wheelchair from automobile
A disabled rehabilitation counselor needed a way to signal co-workers that she needed assistance in removing her wheelchair from her car.

SOLUTION: Remote control signal system
A commercially available radio signal transmitter and receiver were obtained and modified for use by this client. The Linear Corporation (347 South Glasgow Avenue, P.O. Box 6019, Inglewood, CA 90301, (213) 649-0222) produces the transmitter, transformer, and receiver which were modified. The transmitter is $19.70; the transformer is $8.00; and the receiver is $33.00.

FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #18.

W-127
Multiple Sclerosis
Paraplegia with U.E. Weakness
Circuit Board Testing/ Repair

Workstation Modification

PROBLEM: Inability to remove circuit boards from edge connector
A senior electronic technician employed by a large mini-computer manufacturer needed a way to allow him to perform his job duties, which had become increasingly difficult due to mutliple sclerosis.

SOLUTION: Remote edge connector
A remote edge connector was designed and fabricated which allowed the client to remove the circuit boards with ease. This edge connector was placed in a pneumatically height-adjustable unit for access to several boards without increasing fatigue. Several pneumatically operated chip clips were designed and fabricated as were several different clear plastic guides for use

with the chip clips. These modifications were set up to take full advantage of the physical abilities of the client.

FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #18.

W-128
Polio
Difficulty Lifting and Reaching
Book Access

PROBLEM: Difficulty manipulating heavy books from bed
Easily-moved, height-adjustable shelving was needed for a post-polio magazine editor working from her bed. Source documents and manuscripts were difficult to reach and lift from wall shelves.

Lifting Aid

SOLUTION: Adjustable, revolving storage
A surplus height-adjustable, revolving secretary's chair base was used to fashion a movable, compact storage system for easy access to documents. Storage atop the castered base was accessible from all four sides.

FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #19.

W-129
Muscular Dystrophy
Severe Spasticity
Keyboard Access

PROBLEM: Inability to access computer terminal due to severe spasticity
Due to severe upper-extremity spasticity, an individual had his arms restrained in a wheelchair yet maintained functional fine finger movement. Interaction with a computer terminal was desired but not feasible due to the restraint system.

Dexterity Aid

SOLUTION: Reduced-size keypad
The input to a terminal from the keyboard in many units is simply a hexadecimal code representing each key. A sixteen-key hexadecimal encoding keyboard kit is commercially available and can be used to replace the character keyboard to input the code directly for each character. Minimal upper-extremity movement is required to access a sixteen-key keypad as opposed to a sixty-four-key keyboard.

FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #7.

W-130
Any Etiology
Absense/Paralysis L.E.s
Foot Control Operation

PROBLEM: Inability to operate standard foot controls
Paraplegics, quadriplegics, and bilateral amputees choosing not to wear prostheses cannot operate the foot control of a domestic sewing machine.

Equipment Modification

SOLUTION: Chin-operated attachment
A modified light-dimmer control used with a special chin-operated potentiometer can be attached to the foot control of the machine. The machine speed can be controlled with a small chin movement, thus leaving both hands and arms free to handle the material being sewn. The control circuit is low voltage thus keeping the 110 volt household current away from the operator. The system was designed by the Rehabilitation Engineering Unit at the Rehabilitation Institute, Inc., 261 Mack Boulevard, Detroit, MI 48201.

FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #9.

W-131
Any Etiology
U.E. Impairment
Bench Assembly

PROBLEM: U.E.-impaired workers unable to meet production standards
A job brought to a workshop by a local industry proved to be a long-term, stable job. The requirement was to insert a threaded bolt into a drilled and tapped sleeve. The need for engineering design of the task became appar-

ent when a large number of clients possessing upper extremity disabilities were not able to meet the established production norm of approximately 900 valve handles per hour. The major difficulties encountered were the handling of the materials, the actual assembly, counting the assembled handles, and materials handling after assembly.

Jig/Fixture

SOLUTION: Workstation and associated fixtures for the assembly of valve handles

A two-person work table was designed to centralize the work into a compact and manageable work area. Two-part bins were incorporated into the station with fixtures to assist in the assembly. Two metal drop chutes with micro-switch counters were installed at two convenient locations to facilitate the discharging and counting of the finished parts.

For clients possessing upper extremity limitations, and especially for those clients who have use of one hand, a fixture was designed to facilitate assembly. The fixture may be clamped to the worktable top at either end of the table next to the discharge slot of the drop chutes. Slots were milled into the base of the fixture at two sides to hold the head of the bolt and prevent it from twisting when the sleeve is screwed on. By proper training, clients are able to attach the sleeve to the bolt and with a twist and inward rotation, discharge the completed assembly into the drop chute.

Success has been demonstrated with paraplegics, hemiplegics, triplegics, and some classes of quadriplegics.

FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #4.

W-132
Any Etiology
Wheelchair User
Absent/
Paralyzed Arm
Heat Sealing

PROBLEM: Inability to make neat-appearing heat seals

Many packaging operations require plastic bags to be heat sealed. Hand-held heat sealers require careful alignment since the heating element is not visible. This makes neat-appearing seals difficult for workers who are sedentary or have use of only one arm and hand. Semi-automatic equipment is available that will seal on a prescribed line, but these machines are expensive for sheltered workshops and often require foot operations.

Jig/Fixture

SOLUTION: Hinge and clamp

A hinge was attached to a hand heat sealer so that it could be swung down on a definite line when clamped to a table top. This was accomplished by mounting an extra plate to the back of the sealer to provide the extension needed to mount the hinge. The device is used in sedentary operation. The bag can be laid on the table while the sealing is done, permitting one-handed operation. Sealing with this device will usually take less dexterity than the packaging task.

FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #4.

W-133
Spinal Cord Injury
Quadriplegia
Typing

PROBLEM: Inability to reverse typewriter platen

When an attendant must be available to reaccess a typed line after the machine is indexed, this limits the productivity of high-level quadriplegic typists and hampers the composition of original text. A mechanism is needed to assist persons with limited range of motion in the upper extremities, particularly C5 and C6 level quadriplegics, so they do not require aid in making erasures and realigning copy.

Dexterity Aid

SOLUTION: A typewriter platen reverser
A clamp-on unit has been fabricated which attaches to a typewriter and enables the handicapped typist to roll the platen and correct mistakes or proofread copy. No typewriter modifications are necessary for installation.

FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #4.

RESOURCES FOR FURTHER INFORMATION AND SOLUTIONS

FOR FURTHER INFORMATION (FFI) ENTRIES

#1 **Crotched Mountain Rehabilitation Center**
Greenfield, NH 03047
(603) 547-3311
Contact: Gerald Weisman

The Rehabilitation Engineering Department provides vocational and adaptive equipment services to assist handicapped individuals toward increased physical and/or independent functioning. Staff address all equipment needs, regardless of disability, by providing technical assistance in the design, fabrication, and specification of equipment that will serve this objective. Resources are available to perform evaluations of severely physically disabled people in the following areas: vocational, daily living, independent living, and physical capacity assessments.

#2 **In Southern California:**
Handicapped Centralized Assistance Point (HCAP)
Pacific Telephone
500 East Main Street, Room 202
Alhambra, CA 91801
Voice: (800) 242-4565; TDD (800) 242-4570

In Northern California:
HCAP
Pacific Telephone
626 West Grand Avenue
Oakland, CA 94612
Voice: (800) 772-3240; TDD: (800) 772-3140
Contact: Ray Disinger

These Special Assistance Centers have staff trained to help those who need special services and equipment. There is a special new service for deaf persons who communicate by teletypewriters. It provides access to the Business Office, Directory Assistance, Repair, and other services.

#3 **Institute for Information Studies**
200 Little Falls Street, Suite 104
Falls Church, VA 22046
Contact: Richard Vash
(213) 798-3959

The Institute for Information Studies is a nonprofit organization involved in research for and about disabled individuals and their problems.

#4 **Rehabilitation Engineering Center**
Texas Institute of Rehabilitation and Research
1333 Moursund Avenue
Houston, TX 77030
(713) 797-1440
Contact: Thomas A. Krouskop, P.E., Ph.D.

The Texas Rehabilitation Engineering Center is a multi-institutional program that applies technology to solve problems that limit the severely disabled person's quality of life. The Center develops devices and methodologies to reduce the risk of pressure-induced breakdown—bedsores. Along with kidney prob-

lems, bedsores are currently the greatest problem limiting the productivity and independence of persons with severe neuromuscular disabilities. The major program areas that comprise the Texas Rehabilitation Engineering Center are: tissue pressure management, clinical device development, implant materials, and support of the vocational industrial center.

#5 Work Preparation Center
Rancho Los Amigos Hospital
7601 East Imperial Highway
Downey, CA 90242
(213) 922-7718
Contact: Roy Mayeda

The Center is part of the Vocational Rehabilitation Services Department and offers work evaluation, skill evaluation, psychometric testing, and work adjustment to a severely involved, physically disabled population. This orientation has resulted in the development of special devices for one-handed and other severely involved clients, resulting in increased productivity and enhanced placement and training potential.

#6 Rehabilitation Engineering Center
University of Virginia
P.O. Box 3368
University Station
Charlottesville, VA 22903
(804) 977-6730
Contact: James R. O'Reagan

The core area at this Center is spinal cord injury research, specializing in wheelchair mobility and research in neural and structural aspects of the spine. The wheelchair mobility effort can be applied to all types of patients and covers both powered and user-propelled wheelchairs. Powered wheelchair tasks include: performance testing commercially available wheelchairs, designing electric motors and drive systems, testing batteries, and designing motor controllers. Their goal is to develop basic engineering data that contribute to the efficiency of electrically powered systems. This data can then serve as design criteria for the next generation of powered wheelchairs. Other activities include: evaluation, information dissemination, and cooperation with industry.

#7 Courage Center
3915 Golden Valley Road
Golden Valley, MN 55422
(612) 588-0811
Contact: Raymond E. Fulford

Program emphasis at this Center is in the area of aids to independent living, vocational accommodation, and aids to nonverbal communication. Activities include: assessment of individual need for electronic/mechanical assistive devices; recommendation and modification of available commercial products; design and development of individual problem solutions; and provision of information to the community on available aids and devices for disabled persons. Courage Center is a parent organization which sponsors programs in camping, medical and vocational rehabilitation, educational and residential services, athletics, and recreation.

#8 Communication Disorders Department
Rancho Los Amigos Hospital
7601 East Imperial Highway
Downey, CA 90242
(213) 922-7682
Contact: Elyse Passoff

Rancho Los Amigos Hospital's Non-Oral Communication Clinic is composed of a five-phase program consisting of a physician-attended screening clinic, communicative evaluation, functional evaluation, and

communication treatment. The clinic serves a wide range of communicative disorders and medical etiologies, some of which include: cerebral palsy, head trauma, stroke, progressive neurological diseases, and the laryngectomized patient. A team approach is used to assess and treat non-oral patients and additional allied health consultants are available to interact, based upon individualized needs.

#9 Occupational Therapy Department
Environmental Evaluation Unit
Rehabilitation Unit
Rehabilitation Institute
261 Mack Boulevard
Detroit, MI 48201
(313) 494-9841
Contact: Debra Shetler

The core area of this Center is research through the Rehabilitation Foundation and evaluation in the specific areas of mobility, environmental controls, home assessment, job-site modifications, and communication through the Communication Aids Clinic. In conjunction with direct services, they provide training and education programs for patients and family as well as modification and fabrication of devices.

#10 Rehabilitation Engineering Center
University of Michigan
208 W.E. Lay Automotive Laboratory
Ann Arbor, MI 48109
(313) 763-6632
Contact: James L. Cockrell

The major emphasis of this Center is the application of engineering technology to transportation vehicle devices and systems for severely disabled people. The Center addresses problems of both physical disability and brain damage and includes both research and device development.

#11 Kurzweil Computer Products
33 Cambridge Parkway
Cambridge, MA 02142
(617) 864-4700
Contact: Sara C. Rhoten

Reading machine research and development focuses on improving computer software. Current projects underway in the software department include: increased character-recognition ability in dealing with aberrated, defaced, or poorly printed characters than was previously possible, and greater reliability in the machine's capacity to deal with complex formats.

Continuous, concentrated efforts in the area of synthetic (or electronically generated) full speech are reflected in each new release as refinements are written into the programs by experts in phonetics and linguistics.

#12 Northwestern University
Rehabilitation Engineering Program
Room 1441
345 East Superior Street
Chicago, IL 60611
(312) 649-8560
Contact: Margaret Pfrommer

The primary objective of this program is the improvement of internal joint prostheses. This includes studies of the biomechanics of human joints, theoretical studies of the joint-tissue interface, studies of biomaterials, and the clinical application and evaluation of existing internal prostheses. A second major objective is the development of technological systems for severely disabled persons (such as persons

with quadriplegia). These devices include environmental and mobility systems, educational and vocal aids, and communication systems. The program conducts a monthly clinic which provides consultation services to physicians who wish to refer patients whose problems may require engineering-type solutions.

#13 Harvard-MIT Rehabilitation Engineering Center
300 Longwood Avenue
Boston, MA 02115
(617) 253-5333
Contact: Michael Rosen

This is a joint engineering and clinical research project located at the Children's Hospital Medical Center, M.I.T. Department of Mechanical Engineering, and the Brigham and Women's Hospital. The core area of research at this Center is neuromuscular control using sensory-feedback systems. The Center also works in the area of communications.

#14 Rehabilitation Engineering Center
2021 North Old Manor
Wichita, KS 67208
(316) 688-1888
Contact: Leah May Ross

The core area at this Center is vocational aspects of rehabilitation. The Center develops adaptive equipment to make working and living conditions easier.

#15 Rehabilitation Engineering Section
California State Department of Rehabilitation
830 K Street Mall
Sacramento, CA 95814
(916) 323 2959
Contact: M. James Christenson

The core area of research at this Center under the existing NIHR grant is the development of a model service delivery system for rehabilitation engineers. A unique aspect of this grant is that attempts are being made by all engineers to visit the home or work site of each handicapped individual in making the engineering analysis.

This grant also calls for the development of an information system in cooperation with NARIC, the National Rehabilitation Information Center. The Center will employ information brokers in California who will respond to inquiries from consumers and service agencies nationwide. They will have access to a computer program through NARIC which will contain data on all commercially available assistive devices, numbering around 10,000.

#16 IMPART
Texas Rehabilitation Commission
118 East Riverside Drive
Austin, TX 78704
(512) 447-0106
Contact: Carol Whitcraft

The IMPART project presents a research utilization laboratory funded by the National Institute of Handicapped Research and the Texas Rehabilitation Commission. The IMPART project offers the services and resources of trained rehabilitation engineers to match the problems of severely handicapped persons with available rehabilitation technology. The core area of research is accessing information and specifications on rehabilitation technology and barrier removal for rehabilitation counselors, physical and occupational therapists, physicians, and other practitioners. The IMPART project prefers to work with the rehabilitation service delivery counselors because they are then able to purchase the identified and recommended devices.

#17 Rehabilitation Engineering Services
Michigan State University
930-D West Holmes Road
Lansing, MI 48910
(517) 394-6821
Contact: Clendon P. Wooldridge

Rehabilitation Engineering Services primarily serves individuals with severe physical limitations, helping them to achieve enhanced independent living and employment. Michigan State University's University Center for International Rehabilitation (UCIR) established the rehabilitation engineering project to assist the Michigan Bureau of Rehabilitation and other agencies in serving clients having unmet needs related to rehabilitation technology. An engineer, occupational therapist, placement specialist, rehabilitation engineering technician, and a secretary compose the project's interdisciplinary staff.

#18 Tufts - New England Medical Center
Biomedical Engineering Center - Box 1009
171 Harrison Avenue
Boston, MA 02111
(617) 956-5036
Contact: Jonathan C. Bretz

The core area for this Center is communication systems for individuals with nonvocal disabilities. A number of projects deal with applying appropriate electronic design with human factors engineering to provide a device that can be operated by an individual with limited physical ability. The objective of a project in the area of posture and support is to develop a seating procedure which minimizes the cost of fitting and fabrication while maximizing the benefit to the client. A comparable effort is underway to design and build an instrument to accurately determine the pressure distribution under a seated or reclining patient. In all its efforts, the department is committed to a policy of prompt dissemination and utilization of research results.

#19 Job Development Laboratory
Division of Rehabilitation Medicine
The George Washington University Medical Center
Suite 420
2300 Eye Street, N.W
Washington, DC 20037
(202) 676-3847
Contact: Jim Mueller

The core area of research at this Center is the rehabilitation outcome of severely disabled individuals. This is dependent on the interrelated areas of psychosocial, vocational, and performance capability factors.

#20 TOMCO Enterprises, Inc.
7701 Hoover Road
Valley Center, KS 67147
(316) 755-2269
Contact: Barney Hoss

TOMCO Enterprises is a small organization formed four years ago to manufacture the units described, which consist of the motorcycle and attached sidecar. Currently, fifty units have been designed and are in use throughout the United States and Canada.

#21 Rehabilitation Engineering Center
Case Western Reserve University
Department of Orthopedics
2219 Adelbert Road
Cleveland, OH 44106
(216) 459-3480
Contact: P. Hunter Peckham

The primary emphasis at this Center is restoration of upper-extremity control in severely disabled clients. Projects ongoing in the Center are: restoration of upper-extremity function through functional electrical stimulation or through tendon transfer; control of abnormal muscle contractions; evaluation of abnormal motor control; and command control development. Activities of the Center are coordinated with other laboratories in the university and medical community with whom common interests and resources are shared, namely the Engineering Design Center, Applied Neural Control Laboratory, and Motion Study Laboratory.

#22 Telesensory Systems, Inc.
3408 Hillview Avenue
Palo Alto, CA 94304
(415) 493-2626
Contact: Avner Ben-Dor

Telesensory Systems, Inc. was founded approximately ten years ago to develop technology for disabled individuals, primarily those who are blind. Since then, they have expanded their area of concentration to include the design of devices used in nonvocal communication and the early identification of deaf infants. T.S.I. aims to increase independent living opportunities for disabled persons.

NIHR-SUPPORTED REHABILITATION ENGINEERING CENTERS

Please delete pages IV-7 and IV-8 from your Sourcebook, and insert the following pages.

Rehabilitation Engineering Center
Rancho Los Amigos Hospital
7601 East Imperial Highway
Downey, CA 90242
(213) 922-7167
Project Director: Dr. James B. Reswick

This Rehabilitation Engineering Center has three core areas of research, the primary area being the study of functional electrical stimulation. The neuromuscular engineering group working in the area states its goal: to use electrical stimulation to alleviate problems of patients with chronic disabilities, and to encourage the commercialization of equipment that has been found to be effective in carefully controlled, clinical studies.

Pathokinesiology, which deals with the objective measurement of human functioning in normals and patients, is the second core area. Staff use a wide variety of modern instrumentation techniques in relating these measures to pathology. The final core area is a utilization and service delivery project called "Project Theshold," which involves the California State Department of Rehabilitation. The project offers independent living evaluations, home and/or work site assessment, consultation on equipment, modification of commercially available equipment, and the design of custom equipment when no commercial source is appropriate.

Rehabilitation Engineering Center
Kruzen Research Center
Moss Rehabilitation Hospital
12th Street and Tabor Road
Philadelphia, PA 19141
(215) 329-9580
Acting Project Director: Dr. Gordon Moskowitz

The core area for research at the REC-MRH is locomotion and mobility for physically disabled individuals. Clinical evaluations are carried out for other groups, and a Rehabilitation Engineering Clinic is conducted to determine the proper role of the engineer in service delivery. Staff conduct education and publication programs to acquaint clinicians, researchers, counselors and others with the results of their work.

Harvard - M.I.T.
Rehabilitation Engineering Center
c/o Children's Hospital Medical Center
300 Longwood Avenue
Boston, MA 02115
(617) 734-6000, Ext. 2866
Project Director: Dr. William Berenberg

FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #13.

Rehabilitation Engineering Center
Texas Institute for Rehabilitation and Research
1333 Moursund Avenue
Houston, TX 77030
(713) 797-1440
Project Director: Dr. Thomas A. Krouskop

FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #4.

Rehabilitation Engineering Center
The University of Iowa
Carver Pavilion
Iowa City, IA 52242
(319) 356-3470 or -3472
Project Director: Dr. Reginald R. Cooper

The core area for research at this Center is low back pain, one of the most common and most costly of all handicaps in the U.S.A. Many patients have low back pain caused by or aggravated by mechanical phenomena (falls, activities, etc.); these patients can be distinguished from those suffering from other causes. Mechanical (exercises, bracing) and electrical (nerve stimulation) devices can substantially improve the lives of these patients. The Center researches means of more specifically diagnosing, evaluating, and rehabilitating these individuals.

Rehabilitation Engineering Center
Smith-Kettlewell Institute of Visual Sciences
2232 Webster Street
San Francisco, CA 94115
(415) 561-1630
Project Director: Dr. Arthur Jampolsky

The core area of this Center is research and evaluation activities relating to sensory aids for blind and visually impaired individuals. The interdisciplinary staff includes experimental psychologists; biophysicists; neuro-physiologists; and electrical, electronic, mechanical, and computer engineers. An informal consortium of local organizations working with blind and visually impaired individuals has been established and includes: Smith-Kettlewell, Pacific Medical Center, University of California School of Optometry, University of California Medical School, University of the Pacific School of Engineering, Stanford University School of Engineering, San Francisco State University Department of Special Education, Veterans Administration Western Blind Rehabilitation Center, California State Department of Rehabilitation, Sensory Aids Foundation, San Francisco Lighthouse for the Blind, and Telesensory Systems, Inc. Recent work has been focused on vocational rehabilitation engineering, graphic displays, paperless Braille, orientation and mobility research, information storage and retrieval, low vision research, evaluation of sensory aids developed elsewhere, deaf-blind communications, and informal dissemination.

Rehabilitation Engineering Center
The University of Tennessee
Department of Orthopaedic Surgery
1248 La Paloma Street
Memphis, TN 38114
(901) 525-2531
Project Director: Dr. Robert E. Tooms

In generalized terms, the two core areas of this Center are seating and mobility, and ADL independence. Emphasis is on the needs of the young congenital amputee, the young paraplegic, and the brain-damaged child. The interrelated core objectives of the program are: to develop a system of improved prosthetic devices to enhance the independence of congenital and early-acquired amputees; to develop concepts and devices for the improved management and mobility of congenital and early-acquired paraplegics; to develop concepts and systems of assistive devices to enhance the home management and educational potential of young severely handicapped persons and brain-damaged individuals; and, to apply technology to enhance the community and vocational integration of severely handicapped young adults.

Rehabilitation Engineering Center
Case Western Reserve University
School of Medicine, Department of Orthopedics
2219 Adelbert Road
Cleveland, OH 44106
(216) 444-3040
Project Director: Dr. Charles H. Herndon

FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #21.

Rehabilitation Engineering Center
Cerebral Palsy Research Foundation of Kansas, Inc.
P.O. Box 8217
2021 North Old Manor
Wichita, KS 67208
(316) 688-1888
Project Director: Mr. John F. Jonas, Jr.

FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #14.

Rehabilitation Engineering Center
The University of Michigan
W.E. Lay Automotive Laboratory
Room 208
Ann Arbor, MI 48109
(313) 763-6632
Project Director: Prof. J. Raymond Pearson

The core area for this Center is research on automotive transportation for disabled persons. The core area is divided into five subareas: driver assessment, driver performance, device development, safety evaluation, and service delivery systems.

Rehabilitation Engineering Center
School of Medicine
University of Virginia
P.O. Box 3368, University Station
Charlottesville, VA 22903
(804) 977-6736
Project Directors: Dr. Warren G. Stamp
Dr. Colin A. McLaurin

FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #6.

Rehabilitation Engineering Center
Children's Hospital at Stanford
520 Willow Road
Palo Alto, CA 94304
(415) 327-4800
Project Director: Mr. Maurice A. LeBlanc
Contact: Sandi Enders, O.T.R.

The Center provides direct services to children and adults in the areas of: seating and mobility, communication, tissue trauma prevention, orthotics, and prosthetics. Its NIHR-funded core area of research involves controls and interface for communication and other systems used by severely disabled persons. A catalog of these controls is available. An information and referral service on equipment for disabled persons can be contacted through the Center at (415) 327-1111. Also under NIHR support, the Center conducts a seminar each spring on rehabilitation engineering services, as well as other workshops throughout the year and a rehabilitation engineering clinical internship. The VA and NASA also support research projects at the Center on seating for body positioning, prevention of tissue trauma, and on a versatile, portable speech prosthesis, respectively.

NIHR-FUNDED RESEARCH AND TRAINING CENTERS

Rehabilitation Engineering Center
Institute of Rehabilitation Medicine
New York University Medical Center
400 East 34th Street
New York, NY 10016
(212) 340-6042

Co-Directors: Myron Youdin, M.E.E.
Theobald Reich, M.D.

The core area of research at this Center is the evaluation of the functional performance of devices for severely disabled individuals. The Clinical Evaluation Project has been conducting long-term (1-3 years) clinical evaluations of selected categories of electronic assistive devices for persons with high-level spinal cord injury and muscular dystrophy. Results are reported for product performance, operational characteristics and user acceptance in laboratory, bedside, home, school, and work settings. Current categories of evaluation include: environmental controls, mobility for powered wheelchairs, electric page turners, telephones, powered door openers, and audio recorders. The Engineering Evaluation Project involves the Center for Specification and Evaluation of Functional Performance of Services and Instruments for the Severely Disabled. This project increases the self-sufficiency and productivity of the physically disabled by developing specifications for the functional performance of instruments and devices for disabled persons and protocols for demonstrating instrument compliance with the functional requirements. Current categories of research also include: engineering evaluation of stationary stand-up frames and stand-up wheelchairs for disabled persons, braking systems for powered wheelchairs, remote control door controls, and remote controls for environmental control systems.

Medical Rehabilitation R&T Center
Tufts University
171 Harrison Avenue
Boston, MA 02111
(617) 956-5625

Project Director: Dr. Paul Corcoran

FOR FURTHER INFORMATION: See the section on "Resources for Further Information and Solutions," FFI #18.

Cairo Rehabilitation Center
Bustan El Kashab
Cairo, Egypt, Monira

Project Director: Dr. Salah Hommossani
Under Secretary of State for Rehabilitation
Ministry of Social Affairs

The core area of this Center is architectural barriers. The Center designs and develops standards for a barrier-free environment. It focuses particularly on spinal cord injured individuals, caring for them until they are fully integrated into society. The Center also studies and develops mobility systems and designs and manufactures utensils and equipment to improve performance of the activities of daily living.

Rehabilitation Engineering Center-Poznan
Institute of Orthopaedic Surgery and Rehabilitation
Poznan Academy of Medicine
Dzierzynskiego 135
61 545 Poznan, Poland

Project Director: Prof. A. Senger, M.D.

The core area of research at this Center is functional restoration of disabilities of the hand and upper extremities. Major emphases are directed toward surgical reconstruction utilizing technology of the hand and arm/forearm, technological adaptation of the industrial/business workplace for persons with upper extremity dysfunction, and technological innovations in the design and development of upper extremity prosthetic/orthotic systems.

Rehabilitation Engineering Center
University of Ljubljana
Faculty of Electrical Engineering
61001 Ljubljana, Trazaska 25
Yugoslavia

Project Director: Dr. Alojz Kralj

The core area of this Center is functional electrical stimulation of paralyzed neuromuscular systems. Major emphases are directed toward the utilization of electrical stimulae to produce controlled muscular contractions in lower extremity and trunk musculature to provide for body functions of gait and posture, as well as bladder and bowel functions of persons in which these functions have been compromised through disease or trauma.

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READER RESPONSE FORM

The Institute for Information Studies is committed to producing the most useful and current information on rehabilitation topics for disabled consumers and other members of the rehabilitation community. Therefore, we seek to identify your interests and needs, and to determine how we can improve our publications. The information you give us will be used to select relevant topics and channels for promotion and distribution for the coming year. We would greatly appreciate your completing the form below by checking the appropriate spaces corresponding to your situation.

1. I would like to be on your mailing list to hear about upcoming publications or services
   ☐ yes ☐ no

   Name _____ Title _____

   Organization _____

   Address _____ / _____ / _____ / _____
   Street (Box #) City State Zip

   Telephone # _____ / _____
   area code

2. I am disabled. ☐ yes ☐ no
   I have a disabled person in my family. ☐ yes ☐ no
   I am visually impaired. ☐ yes ☐ no

3. I work in:
   - ☐ 01 State rehabilitation agency (general)
   - ☐ 02 State rehabilitation agency (blind)
   - ☐ 03 Private rehabilitation agency/workshop
   - ☐ 04 Federal or regional government office
   - ☐ 05 Rehabilitation professional organization
   - ☐ 06 Disabled consumer organization
   - ☐ 07 Insurance company
   - ☐ 08 Legislative-branch office
   - ☐ 09 Medical organization
   - ☐ 10 Academic institution
   - ☐ 99 Other organization (please describe) _____

4. I work as a:
   - ☐ 01 Rehabilitation counselor
   - ☐ 02 Job placement specialist
   - ☐ 03 Educator/researcher
   - ☐ 04 Staff development (training) specialist
   - ☐ 05 Administrator
   - ☐ 06 Public information provider
   - ☐ 07 Medical practitioner (including practitioners of such allied medical professions as nursing, physical and occupational therapy)
   - ☐ 99 Other profession (please describe) _____

5. I read _____
   Name of this Emerging Issues Publication

6. I have read the following Emerging Issues publications:
   (Check all that apply)
   - ☐ *Work Disincentives*
   - ☐ *How to Make Friends and Influence the Media*
   - ☐ *New Life Options: Independent Living and You*
   - ☐ *Rehabilitation Engineering Sourcebook*
   - ☐ *Learning to Live with Disability: A Guidebook for Families*
   - ☐ *Financial Resources for Disabled Individuals*
   - ☐ *Lobbying for the Rights of Disabled People: Views from the Hill and from the Grass Roots*
   - ☐ *Hiring and Supervising Personal Service Providers: A Guide*
   - ☐ *Rehabilitation Engineering Sourcebook Supplement I*

7. I found this publication (check all that apply):

Practical	☐ yes ☐ no	Too short	☐ yes ☐ no
Informative	☐ yes ☐ no	Too technical	☐ yes ☐ no
Relevant to my needs	☐ yes ☐ no	Too simplistic	☐ yes ☐ no
Clear	☐ yes ☐ no	Too vague	☐ yes ☐ no
Too long	☐ yes ☐ no	Too detailed	☐ yes ☐ no

Other comments _____

8. I found out about this publication from:
   - ☐ Newsletter article or review. Which newsletter? _____
   - ☐ Press release
   - ☐ Review copy
   - ☐ Conference exhibit
   - ☐ Journal article or advertisement. Which journal? _____
   - ☐ Friend or colleague. For which organization does this person work? _____
   - ☐ Receiving an advance order form
   - ☐ Don't remember/not sure
   - ☐ Other (please describe) _____

9. What I liked most about this publication was:

   _____

   _____

   _____

10. For future, similar publications, here are some ways I think you could improve your product's content, format, and/or distribution:

    _____

    _____

    _____

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11. I would be interested in seeing future publications on these subjects:

	Very Interested	Somewhat Interested	Uninterested
Job Opportunities for Disabled Persons in Science and Technology			
How to Use Sheltered Workshops			
Sexuality/Intimate Relationships			
Housing and Homemaking for Disabled Individuals			

12. I would be interested in attending a workshop, if conducted in my area, on:

	Very Interested	Somewhat Interested	Uninterested
Small Business Enterprises for Workers with Disabilities			
Social/Interpersonal Skills of Disabled Persons			
Job-seeking Skills			

13. I would be willing to travel (and have funds available) to attend such a workshop.
    ☐ yes ☐ no

Thank you for your valuable cooperation!

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_____ *Learning to Live With Disability: A Guidebook for Families*
_____ *Lobbying for the Rights of Disabled People: Views from the Hill and from the Grass Roots*

I would like to be on your mailing lists to hear about upcoming publications or services. ☐ YES ☐ NO

Name _____ Title _____

Organization _____

Address _____

City _____ State _____ (Zip)

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Area Code

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